SCIENTIFIC AMERICAN

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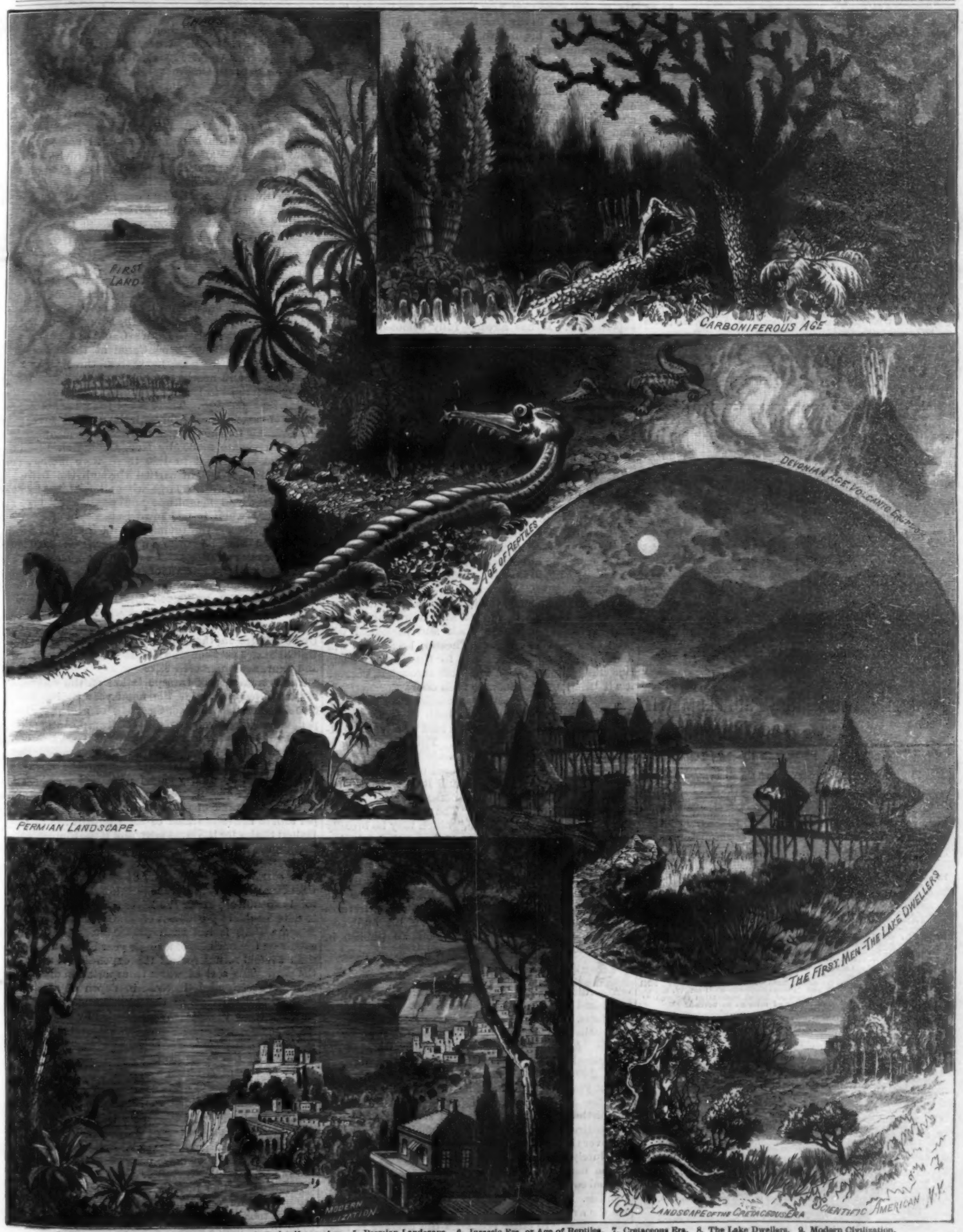

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Scientific American.

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NEW YORK, SATURDAY, JUNE 25, 1892.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 860.

For the Week Ending June 25, 1892.

Price 10 cents. For sale by all newsdealers.

THE SEVEN AGES OF OUR WORLD.

We publish on another page an interesting series of pictures, illustrative of the formation, growth, and development of this earth, from the time of its first formation from a nebulous mass. These pictures have been faithfully copied from the original set scenes which have been arranged to put in practical shape this wonderful history before the eyes of an audience. The scenes are elaborate in their detail, and give to the beholder a very vivid idea of what they are intended to represent. Some wonderfully beautiful effects are produced by the use of electric lights and steam vapor.

It is primarily to the far-reaching discernment of Mr. Morris Reno that New York owes its Urania Scientific Theater, in the Carnegie Music Hall. It must be admitted, to begin with, that the "rania" idea is of European origin; at least it had its first successful embodiment in Berlin, where a Urania theater has been in operation for four years. Mr. Reno, perceiving the excellence of the entertainments given in Berlin, and their uncommon educational value, believed that a similar theater could and should be established in New York. He interested Mr. Andrew Carnegie in the project, and Mr. Carnegie entered upon it with his customary enthusiasm for anything which tends to popular education. So the novel enterprise started out, late last winter, backed by intelligent appreciation and unlimited capital.

It is not to be understood that Mr. Carnegie has expended, or intends to expend, a fortune upon the Urania Theater (although, as a matter of fact, a great many thousand dollars had to be sunk to start it), but simply that the influence of his princely wealth and his world-wide reputation for philanthropic deeds buoyed up the undertaking and enabled it to pass successfully through that first critical stage which attends all such experiments. It has already fully demonstrated its usefulness, it has received the unqualified approval of some of our foremost educators, and it has awakened a degree of popular interest that is truly astonishing. Considering the indifference shown to anything that possesses a flavor of science, and the sweeping competition of the numberless light and frivolous amusements with which this city abounds, the Urania Theater has been the most remarkable success in the way of popular and intelligent entertainment that New York has seen in many years. It is to the Urania idea that science is in itself entertaining and delightful, and to the extraordinary effectiveness of the means employed upon the stage to illustrate the facts and wonders of science vividly to the eye, that this success is due.

Science has never before had such an opportunity as this is to make good its claims upon the attention of men and women who have been brought up, without knowing exactly why, to shun it as something essentially dull and uninteresting. We who know the real charms, the beauty, the poetry, the inspiration of science, cannot doubt that it will win its way now that it has a chance. Every scientific book and periodical will profit through the Urania Theater, because it will make fresh and eager readers for them; every scientific club and association will profit through it, because it will bring new members to their doors.

Thus far only two lecture spectacles have been produced here, and in each case both the scenery and stage settings, and the apparatus used for electric lighting, were imported from Berlin. They are, however, produced upon a much larger scale here than in the German capital. The first of these entertainments is called "A Trip to the Moon," and it was recently set forth, with illustrations, in the SCIENTIFIC AMERICAN. The second of the series is "The Seven Ages of our World, or from Chaos to Man," which may be broadly described as a pictorial history of the earth, beginning with the time when it first assumed form by condensation out of the original nebulous mass.

The lectures are exceedingly popular in form, and great credit is due Mr. Garrett P. Serviss for the manner in which he treats the subject of his lectures and the interest with which he holds his audience. The abstract of the lecture, which we publish in another column, is in his own words.

The Depopulation of France.

According to *Der Reichsbote*, Berlin, the recently published vital statistics of France reveal some startling facts. The figures for 1890 show that the number of deaths was actually greater than the number of births. According to the report of the Chief of the Statistical Bureau, there were 838,059 births during the year 1890 and 876,505 deaths. Although the data of recent years had led students of statistics to expect that the annual deaths in France would soon equal the births, yet such a sudden and startling revelation was entirely unexpected; and the officials are trying to discover the causes of this phenomenon, which stands absolutely unique on the Continent.

The main reason, doubtless, for the present abnormal condition is the widespread aversion to large families. In France, the one or two system prevails. On the average, France reports 150 children to every 100 families. In other countries the average is more than 300; in England as great as 380. A singular phenomenon in this connection is the fact that in 1890 the number of illegitimate children of French mothers decreased 2,777, while those of foreign women living in France increased 292.

Another fact to be taken into consideration is the physical degeneracy of the people; the higher classes by high living have become effeminate; the lower classes have become weakened and dwarfed by the tasks imposed upon them. It is an undeniable fact that it has become harder and harder for the average family to secure the necessaries of life. The cost of living steadily increases.

A Twenty Foot Channel from Duluth to Buffalo.

The new River and Harbor bill provides a sufficient sum to begin the work of deepening the connecting channels of the Great Lakes, so that there will nowhere be, between Chicago, Duluth, and Buffalo, less than twenty feet of water. The official estimates of the cost of the entire work, as made by Gen. O. M. Poe, called for $3,304,000. This is exclusive of the work on the great new lock in the St. Mary's Falls Canal, and in the Hay Lake channel immediately below in the St. Mary's River, for which provision was made in the River and Harbor bill of 1890. Six points need improvement. Two of these, Round Island and Sailor's Encampment Island, are in the St. Mary's River—the outlet of Lake Superior; Corsica Shoal is at the foot of Lake Huron, and the St. Clair Flats Canal, Grosse Point Flats and the Limekiln Crossing are between the foot of Lake Huron and the head of Lake Erie.

Few persons who have not made a personal study of the matter realize the magnitude of the traffic of the Great Lakes. There were over 1,100 more vessels passing through the canal into Duluth, Minnesota, in 1891, than passed through the Suez Canal the year previous. Through the "Soo" Canal at the outlet of Lake Superior there were more than three times as many vessels and nearly a million and three-quarters tons more freight in 1890 than through the Suez Canal during the same year. There is not the same absolute record of vessels passing through the Detroit River as is obtainable for the two points previously mentioned. But an estimate made by Hon. George H. Ely, of Cleveland, shows that in 1889 there were more than 36,000,000 tons of freight carried through the Detroit River. This sum seems large when it is stated by itself, but the real magnitude will perhaps be better appreciated when it is known that this is 10,000,000 tons in excess of the tonnage at all the seaports of the United States for the same year, and 3,000,000 tons in excess of the total arrivals and clearances, both coastwise and foreign, of Liverpool and London combined. The arrivals and clearances of vessels at Chicago for 1890 numbered 21,541, while the corresponding aggregate for New York was but 15,283. The entries and clearances for the entire seaboard of the United States in that year were 37,756, while for the United States ports on the Great Lakes the arrivals and clearances numbered 88,280.

The average cost of transportation on the railroads in the United States for the fiscal year ending June 30, 1891, exceeded nine-tenths (·941) of a cent per ton per mile. The average cost of transportation on the Great Lakes for 1891 was, as near as it can be ascertained, about 1 1-10 of a cent per ton per mile. But the importance of the Great Lakes to the business interests of the country may be better understood if these microscopic figures are translated into larger terms. The traffic of the Great Lakes in 1891 was 27 per cent of the total traffic of all the railways of the United States for the same year, and if the tonnage carried on the lakes had been carried instead by rail, at the average price per ton per mile above given, it would have cost, in round numbers, $150,000,000 more than was actually paid for its transportation by water. The total expenditure under the River and Harbor bills up to date for the improvement of the Great Lakes above Niagara Falls is less than $30,000,000. So that the saving on the business of a single year has been a more than fivefold return for all the expenditures made in the past. The cost of water transportation decreases so rapidly with each increase in depth of available channel and capacity of the vessels engaged in the carrying trade that the saving effected by the deepening of the connecting channels from sixteen feet to twenty feet will be greater than that which has been produced by the expenditure of the $30,000,000 in the past.—*Review of Reviews.*

Solidified Petroleum.

Some trials with solidified petroleum were made a few weeks ago at the works of the Solidified Petroleum Corporation at Hackney Wick, London, and they demonstrated that a 6 horse power tubular boiler containing eighty gallons of water could be heated by 62 lb. of the Chenhall fuel (or solidified oil), and in 36¼ minutes steam raised to indicate 60 lb. to the inch, while it took 106 lb. of coal and wood to raise steam to 60 lb. in one hour's time.

The Mercury Mines of Almaden.

The following description of the mercury mines of Almaden is taken from the *Journal de la Chambre de Commerce de Constantinople:*

The mercury mines of Almaden, in Spain, are at a short distance from the town of that name, following the valley in a northerly direction. The veins of the precious metal are disseminated a little hap-hazard, but those at present in working form altogether a zone stretching for a length of from 160 to 170 meters, and which is only from 10 to 12 meters wide.

The depth of the bed is still unknown for the reason that when a vein is exhausted, the depth of the well is increased in order to reach a new vein. Between the different workable veins, there are beds of ores and rocks of different kinds; the average thickness of the unworkable beds varies between 10 and 37 meters.

The deepest gallery at present reaches 317 meters. A curious feature is that the farther the distance gone, the quality of mercury improves and the quantity increases.

In the tenth and eleventh gallery (the deepest) the mercury runs, so to speak, from the rock as resin exudes from the trees; it can be gathered in small skin receptacles.

The rock varies in color and passes from black to brilliant red; the more the color approaches red, the more the quantity of mercury increases. Very often mercury is present under the form of cinnabar or sulphide.

The pits at present in working number three. The other old wells have been abandoned, and only serve in exceptional cases.

On delivery from the pits, the ore is smelted in vast furnaces, with enormous cupolas, beneath which a fierce fire is constantly kept burning.

Distillation is effected through a long and complete series of tubes, formed of thick jars, with a long and narrow neck, fitting into each other.

In the lower portion of these jars there exists a kind of small reservoir where the drops of mercury produced by the evaporation of the metal in a state of fusion are condensed. These drops are then collected and, with the aid of small pipes, stored in large iron barrels. A strong smell, which irritates the eyes and nostrils, escapes from the jars and barrels.

The production of mercury reaches about 55,000 to 60,000 *frascos* per annum; the *frascos* are enormous bottles of cast iron, which contain four arrobes of about 25 pounds each. Each bottle, which measures 22 centimeters in height by 6 in width, weighs, when filled, about 100 pounds.

The workmen at present employed number about 2,000. There are also a thousand workmen who are employed out of the mines with machinery, furnaces, transports, and other works.

Dirty Lenses.

The subject of the transparency of glass has, perhaps, not altogether received the attention which it deserves, and some recent failures in obtaining bright negatives by a friend have brought it rather prominently before the writer's mind. There is an idea abroad that a thick lens is necessarily a slow lens, on account of the thickness of the glass traversed by the light which goes to form the image. Though in some cases this is true, yet with the majority of lenses the loss of light by an increase in the thickness of glass is insignificant, though it is by no means so where a comparison is made between the effect of photographically active rays after traversing even a thin lens and that when they act without the interception on a sensitive surface. Perhaps one of the most instructive lessons to be learnt from Professor Boys' recent papers on the photography of the flight of bullets was the fact that a piece of the thinnest microscopic glass practically cut off as much photographically active light of an electric spark as a slab of the same material—in other words, the absorption by the glass for any rays of any reasonable thickness was almost greater than that of the thinnest microscopic glass. This, perhaps, was better brought out in the case of the light from the electric spark than it was from the light of the sun, for the former contains a much larger range of ultra-violet rays of the spectrum than the latter, and consequently the difference is more marked, but it is merely a matter of degree.

A good plan of showing that thickness of glass in a colorless lens has practically but little influence on the light passing through it is well exemplified by absolute experiment of a very simple kind. Suppose we place a colorless lens in contact with a piece of sensitized paper, such as ordinary albumenized paper or platinotype, and expose it through the lens to direct sunlight, it will be found that the printing action is apparently the same throughout, showing that the thickness traversed has very little to do with the amount of blackening. Indeed, in many cases, no difference can be seen between the part exposed through the central portion of such a lens and of the margins if the lens should be a plano-convex, the plane surface being that in contact with the paper. If we cut a strip of sensitive paper and put it in contact with the convex side, and hold the lens so that direct sunlight travels along the axis, measurements show that the amount of blackening is dependent only on the angle which the surface of the lens, and consequently that of the paper, makes with the perpendicular, and can be calculated out by the ordinary law of cosines. But in order for this to be the case the glass of which the lens is made must be colorless, and of this lack of color a good judgment may be formed by looking at white paper through it; if the glass appear yellowish this will no longer be quite true, and if greenish there will also be proportionally more cut off by the thickest part than by the margins. The present lenses are all, however, made of colorless glass, and therefore by comparing the blackening of sensitized paper when light passes through it and when it does not an idea may be derived of the absorption for any moderate thickness of glass. The glass ordinarily used for photographic plates is of a decidedly greenish hue, and this, it will be found, may cut off as much as 25 per cent of the incident light, so that such glass is really a powerful absorbent of photographically active light. The colorless glass of a lens, on the other hand, will not absorb nearly so much.

Quartz is the only material of which a lens can be made which is seemingly transparent for all rays of this kind. Iceland spar, however, approaches it when sun or sky light is in question. There is, however, a far greater possible loss of light in lenses than this absorption, and that is dirt. The negatives which were placed in the writer's hands were of a peculiar character. They were not overexposed, for in the shadows there was, in some cases, no detail whatever, although there was a deposit over what should have been transparent parts; but the margins of the plates, which were covered by the rebates, were devoid of any trace of veil. From that it was evident that the plates were not in fault, and the defect must have arisen either from stray light in the camera or coming through the lens, or from the lens itself. The lens was capped, and an exposure of a plate in the camera with the lens in that condition showed that the defect was not due to light percolating into the camera. After a little further examination the lens itself was scrutinized, when it was found that the surfaces were not exactly dusty, but greasy—in fact they looked like the surface of a London window which has not been cleaned for a month. This state of the lens at once gave a clew to the cause of the faulty negatives. A trial negative of a subject was taken with it, when the same veil as seen in the other negatives was apparent. The lens was then carefully polished with a chamois leather, and finally with a soft silk handkerchief, and a negative of the same subject was again taken, with the result that the veil had entirely disappeared.

The facts then are these, the dirt on the lens became a source of light from outside sources and illuminated the plate sufficiently to cause this fog. When exposure was made there were thus two sources of light, as it were, at work, the one forming the image and the other scattering in all directions the light which the dirt stopped. The one gave the image, the other veiled it. In extreme cases the writer has known as much as thirty per cent of the light to be stopped in this manner, and supposing the scattering took place in all directions, there would, in this case, be almost as much ill-directed light coming on to the plate as there would be of light to form the half tones of the image, for it must be recollected that in the case of a doublet lens it would receive not only the light from the object to be photographed, but also the light coming in all directions, giving the dirt an extra illumination. With a single lens with the stop in front this is saved to a large extent, and, therefore, it is safer to use a dirty single lens than it is to use a doublet in a similar condition. But the question arises, Why have dirt at all on the lens? This is a question which should be taken to heart by all photographers. It is not the professional photographer who is likely to neglect the polish of his lens, but the amateur, who very often puts it into winter quarters, and then withdraws it for use in the spring, and he probably never stops to consider whether it is in the same state as that in which he put it away. A fruitful source of the kind of dirt alluded to is that of the fingers. An impression of a hot thumb or finger may often be seen on the lens of a careless amateur, and every point of grease becomes a source for scattering light. It may be supposed that the limit of scattering is reached when the surfaces of the lens are ground. Between this limit and that of absolute polish comes the intermediate stages of dirt—stages which it may be said should at all events never go undetected.

In photography, as in everything else, "experience teaches," but there is no need that the lesson should be practically learnt by every one. It should suffice that some have met with what we may call this incident, and have pointed out the bad effects of it. It must never be forgotten that even a thoroughly cleaned lens is, to a certain extent, a source of illumination. Perfect transparency does not exist, and this being so, the glass is always to a certain extent a cause of a slight veil. This is one reason why a plate which is exposed when the lens faces the sun always gives a veiled image. The object to be taken is very much less bright than the sky is; the image is formed by comparatively feeble rays, whereas the lens is illuminated by the direct sun's rays, and hence a veil is induced. When a pinhole is used, this is not the case to nearly the same extent. While not advocating the use of a pinhole on every occasion, yet it is sometimes useful.—*W. De W. A., in Photography.*

Launch of a Large Steamer at the Works of the Newport News Shipbuilding and Dry Dock Co.

Among the new industries which have been inaugurated in our Southern latitudes is that of iron shipbuilding, and one of the leading concerns in that line is the Newport News Shipbuilding and Dry Dock Company, at Newport News, Va. An example of the extensive capabilities of this establishment is seen in the splendid steamer El Norte, a freight vessel of 4,500 tons, 400 ft. length, which was launched on the 14th of June with great *eclat.*

The general dimensions of the vessel are as follows: Length between stem and after side of propeller post, 380 ft.; breadth of beam, moulded, 48 ft.; depth from top of keel to top of upper deck beams of lowest part of sheer, 33·9 ft.; length over all, 406 ft.; depth of hurricane deck, 33 ft. 9 in.; gross tonnage, 4,552; net tonnage, 3,021; capacity for cotton in bale, 14,000.

The vessel has three decks, with a partial orlop deck at fore end of fore hold. The lower and main decks are divided into sections by ten transverse bulkheads.

The engines and boilers were designed by Mr. Horace See, the superintending engineer for the Morgan Line steamships.

The engines are of the direct-acting, surface-condensing, triple-expansion type. The cylinders are 32, 52, and 84 in. in diameter, by 54 in. stroke of piston. They are designed to work under a pressure of 167 pounds of steam. The valves are all of the piston type, on the front of the engine and close to the cylinders. There is one valve only on the high-pressure and intermediate cylinders, and two upon the low-pressure. They are driven by the See-Marshall gear.

The crank shaft is in two lengths, both pins and main bearings being 16 in. in diameter. Steam will be supplied by three double-ended cylindrical boilers, having three corrugated furnaces at each end. They all lead into a common combustion chamber. The boilers are fired fore and aft from two fire rooms.

Salt Water Baths.

Not many people nowadays deny the wholesome effect of mineral water baths, and M. Albert Robin, of France, who has made a special study of the effect of the mineral salts on the human system, when applied by the bath, has announced some of his conclusions as follows: "A bath containing six per cent of chloride of sodium diminishes the amount of organic matter, uric acid and extractive substances, but increases the inorganic compounds, the amount of nitrogen, urea, chlorides and phosphoric acid. If the bath has twelve per cent of common salt, it gives a brisk stimulation to the nitrogenous interchanges. A bath of twenty-five per cent of salt influences mainly the process of oxidation, while it affects the nitrogen interchanges but slightly.

"This last strong salt bath is, therefore, indicated for patients of sluggish digestion and oxidation, who suffer mostly from diseases of the skeleton, with rachitis or necrosis, or with anæmia.

"It is also good for all persons in whom the nervous system needs to be built up by economizing the nitrogenous interchanges."

In following up this discussion of the biological action of salt baths, the European edition of the New York *Herald* contains a proposition advanced by some enterprising scientists "to utilize the waters of the Dead Sea for antiseptic purposes."

So far as known, no bacteria can abide in this sea, which is densely charged with chlorides of magnesium and sodium, and also contains in large quantities the bromide of potassium and lime.

Whether this will be attempted or not, and whether in case it should be done there will be found any advantage for antiseptic dressing over the ordinary remedies now in use, remains to be seen.

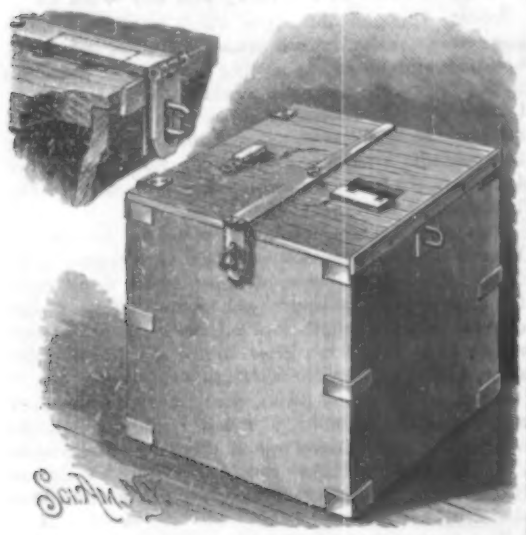
Meanwhile, for certain classes of invalids, especially people of bilious habits and sluggish circulation, says the *American Druggist*, there is fresh encouragement to plunge, when convenient, in the ocean surf, and when not so convenient to make use of the waters derived from the sea salt as may be most easily procured.

Coffee and Strawberries.

The very height of strawberry eating is with coffee. Nobody ever really tasted coffee who has not drunk it in alternate mouthfuls with strawberries, and nobody knows the strawberry flavor excepting immediately after the clearing of the taste which comes from drinking coffee, says the New York *Post*. The clearing property of coffee is familiar enough, but there is strange ignorance of this special application of it. The best of strawberries with the best of coffee makes the supreme refinement of indulgence in the fruit.

AN IMPROVED BALLOT BOX.

A box of strong and simple construction to safely hold ballots deposited therein, and provided with ready means for securely locking the box when the balloting is concluded, is shown in the accompanying illustration. It has been patented by Messrs. Virgil A. Grimes and Charles R. Lame, of Pittsfield, Ill. On the under face of the cover of the box is a recessed angled portion on its four edges, engaging the inner



GRIMES & LAME'S BALLOT BOX.

face of the body of the box at its top edge, as shown in one of the views, so that ballots cannot be inserted in the box by slipping them under the cover at its edge. The front of the cover also has an attached metal plate, and such a plate may be placed on the sides also if desired. The opening for the introduction of the ballots is provided with a hinged metal lid, and the locking device consists of a bar pivoted centrally on the top of the cover. When the lid is closed this bar is swung over it, the bar then engaging on its inner end a stop plate or block on the top of the box, while its front end, provided with a hasp, is engaged by a staple, and locked on the front of the box. When the box is in use to receive ballots, the locking bar is swung across the cover from side to side, its hasp being then engaged and locked upon a side staple. The lid of the box may be made to simply lift out from the body of the box if desired, the box being also provided with other metal or strengthening strips as may be deemed necessary.

INTELLIGENCE OF PARROTS.

I have for twenty-three years owned a female parrot of Gaboon, with ashen gray plumage and a red tail, aged at present about forty-eight years, and which the reader will find figured herewith. This bird, whose plumage is very well preserved for its age, is so remarkably intelligent that it has seemed to me that it would be interesting to give an account of it to my

FEMALE PARROT OF GABOON.

readers. Although it imitates and remembers all the noises and all the sounds that it hears, the characteristic of this bird is a particular originality which is peculiar to it, and which makes of it both an imitator and a creator.

Before it became my property this bird was kept in a house at Paris that had a large number of tenants. It imitated to perfection the language of the sparrows that fought upon the roof and in the courtyard of the house, their contests in spring for the possession of a nest, and their daily quarrels.

It imitates also all the cries of Paris, and especially the cry of the clothes peddler, and many a time have the inhabitants of the house been deceived by this faithfully reproduced sound. When my brother-in-law gave me this bird in 1870, I placed it in the hands of our farmer, in the country, while I was doing service in the army during the war.

Its repertory then became enriched with all the sounds of nature—those of the quail, the owl, the magpie, the cock, and the hen, in all their vocal manifestations. It excels in the phonetic reproduction of the death of the hog, at which it has certainly been present. It reproduces in the first place the broken cries, low or shrill, of impatience and fear of the animal while being dragged to the place of slaughter, and then the howls of anguish during the process of throat cutting, and this with the same shades of gradation and force as manifested by the animal itself. Although it has not heard these sounds in twenty-two years, this death *fantaisie* passes through its brain from time to time, and it rattles the windows of my house with it to such a point that I am obliged to silence it.

My parrot observes every motion that precedes an act which will be accompanied with a sound. If it sees me approach an open window and prepare to close it, it immediately imitates the noise made by the window before I have touched the latter. If it sees me holding a handkerchief, it wipes its nostrils. If it sees me holding an overcoat or a frock coat, it immediately, and in advance, makes with its wings the motion that I am going to make with my arms in order to put on the coat.

It imitates the sound of flowing water. If it sees me holding a glass containing a liquid, or merely approaching it, it immediately imitates in advance the sound of swallowing and the descent of the liquid into the throat. If it sees a cat, or if any one calls a cat, it at once imitates all the various forms of the cat language, and the same as regards dogs, horses, and asses.

My parrot puts into all these imitations, often interrupted by peals of laughter, an intelligent intention, malice, and volition. But what is of especial importance to make known about this bird is its faculty of understanding what is going on around it, and of participating therein in language and actions. When any one talks before it, it takes part in the conversation by "oh's" and "ah's" of astonishment and approbation uttered at the apposite moment. It bursts into a fit of laughter if a person says something funny with an air of jovialness. If it needs anything, it calls its mistress by her first name—Marie; and if she is tardy in coming, its voice gradually becomes impatient and imperious.

On a certain winter's day it was placed in its cage near the fireplace. A log of wood rolling outward covered it with ashes, sparks, and smoke. Its mistress, busy in an adjoining room, heard it cry, "Marie! Marie!" like a person a prey to a danger, to an excessive fright, and she ran to its assistance.

When its noon meal is served to it, consisting of a few dainties, my parrot daily reserves for its evening meal a small piece of bread and preserves.

It does not like men, who could not touch it without being attacked with its bill and sharp claws. On the contrary, all its caresses are for women, and especially for little girls. It suffices to be of the feminine sex to be able to touch it and caress it without danger. It loves its mistress to distraction. It obeys her commands, and when she corrects it by giving it a few light taps with the finger on the bill or head, it licks the finger that strikes it, and utters little cries asking her pardon.

When, after having gone out, I return home, it knows who it is through the wall, and, although it cannot see me, it apprizes its mistress of my return by singing two notes—*do-do*, the second in the octave of the first. It does that for no other person in the house.

It says good day to me in the same manner every time that I enter the room in which it is placed. If I give it anything, it thanks me with voice and action by raising its wings.

But my parrot excels especially in the extraordinary gift of being a music-mad and composing bird. If it sees a polka danced, it accompanies it with short notes, and in measure, with the same accuracy as a trombone player.

It improvises true musical *morceaux*, which it whistles and incessantly varies, without ever repeating in its improvisations. It produces them with a style that a pupil of the Conservatory might envy. It finishes its improvisations in tone. It improvises in the presence of any one whatever when its mistress asks it to sing. When other persons listen, it interrupts its musical strain from time to time to burst out into a laugh, mingled with "oh!" "oh's!" which indicate that it is happy to be listened to. Before improvising, it often preludes by gamuts trilled and vocalized, like those practiced by a singer to get her voice in trim before going upon the stage.

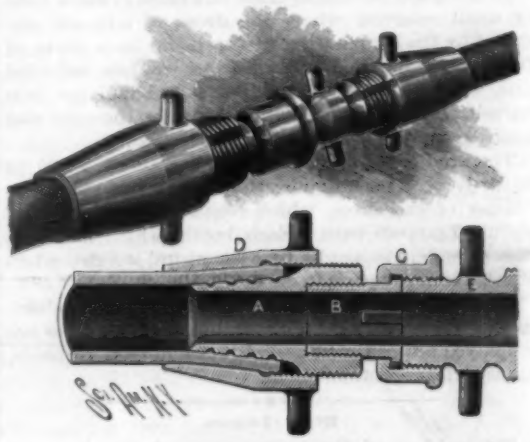
From time to time it stops in order to dry its throat, to swallow its saliva by a motion of deglutition, accompanied with a quick stroke of the tongue against the palate, so that the sound of the whistling shall come out with greater purity. I should say the sound of the flute, for one might believe that he was listening to a large, flexible and well *timbred* instrument of that kind. The grave notes of this instrument are truly remarkable.

When my parrot sings in faithfully imitating the human voice, it often passes from deep bass to the purest soprano in continuing the air.

It likes to open its cage in order to walk around the room and to get under the furniture and to hack the legs thereof with its bill, which cuts oak with the same ease that it does whitewood.

After having carefully and patiently studied all the systems of hooks employed for closing its cage, it unfastened them all. The door was then closed with a carbine swivel. It studied and recognized the mechanism of this, and succeeded in opening it by resting one foot upon the interior spring, while it opened the hinge with its bill. For several months past the door has been closed with a padlock and key. The bird has passed hour after hour in studying this new device, and in turning the key in all directions, but has not yet succeeded in opening it, because the spring is of hard steel.

I should never have ventured to speak of these so astonishing phenomena of intelligence on the part of this bird had not hundreds of persons been witnesses thereof for the past twenty-three years, and even now, when on pleasant days my parrot is placed near an



LENTY'S HOSE COUPLING.

open window looking upon the street, it collects the passers-by of all ages, who are surprised at the music that it offers them.

Children come to play on purpose in front of this window, which surmounts a wide sidewalk. The bird participates in their plays by running rapidly from one end to the other of its cage, as well as a parrot can do so upon a long perch, and in uttering with gleeful cries and laughter the same words that the children do.

I have passed some interesting moments in studying this bird, whose intelligence introduces a new element into the solution of the problem that my friend, the Marquis de Nadaillac, has defined in these terms in his remarkable study entitled "Intelligence and Instinct:" "The reader will thus be able to determine whether intelligence is the real characteristic of man, whether it creates an abyss between him and the animal, and whether there does not exist between beings merely a question of degree; in other words, whether human intelligence differs essentially or only in quantity from that of other beings."—*A. Nicaise, in La Nature.*

AN IMPROVED HOSE COUPLING.

The coupling shown in the picture may be quickly and conveniently applied to any broken hose to unite the parts, and may also be used to connect the ends of sections of hose. It has been patented by Mr. Joseph Lenty, of Troy, N. Y. A hollow plug, A, is adapted to enter the hose, and has on its exterior grooves into which the material of the hose is pressed by means of an exterior tapering sleeve nut, D, the latter having lugs to engage a wrench and a screw-threaded portion engaging a screw on the inner end of the hollow plug. The inner end of the hollow plug is also interiorly screw-threaded, to engage the thread of a swivel block, B, connected by an ordinary locking-sleeve, C, with the threaded end of another hollow plug, E, attached to the end of the other hose section, with which the coupling is made. The coupling separates by disengaging the threaded end of the plug from the locking sleeve. The ends of the hose held between the sleeve

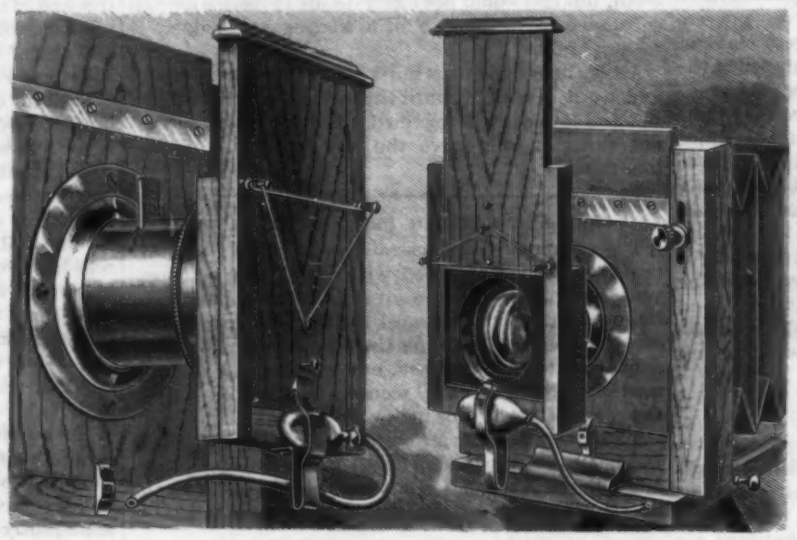
nuts and the tapering ends of the plugs are firmly clamped in place by tightening the nuts.

Further information relative to this invention may be obtained of Mr. J. G. Patton, No. 285 River Street, Troy, N. Y.

A SIMPLE CAMERA SHUTTER.

It would be difficult to say who invented the simple shutter shown in the annexed engraving. It has been made and used by amateur photographers, and seems to answer the purpose very well indeed. Although it is crude when compared with some of the perfected shutters, the results secured by it are not inferior to those of better instruments.

The block forming the support for the working parts is bored to receive the outer end of the camera tube. To this are attached two grooved uprights and a cleat extending across the block at its lower edge. To the grooves of the uprights is fitted the shutter, which consists of a piece of thin board blackened on its inner surface, and provided on its outer surface with three escutcheon pins, all arranged on the median line of the shutter. The lower pin, which is without a head, is engaged by a spring catch. The second pin projects the farthest, while the third projects only a short distance. In each grooved side strip is inserted a pin, which projects some distance from the surface of the strip. An ordinary rubber band is stretched around these pins, and the outer strand is wound several times around each pin, to separate it from the inner strand. The spring catch, which is attached to the bottom of the block, is bent outwardly to permit of placing under it a small pneumatic bulb similar to those used on pen fillers. With the bulb is connected a flexible rubber tube, having on its free end a larger bulb, by means of which the smaller bulb is inflated when the shutter is to be released.



HOME-MADE CAMERA SHUTTER.

The shutter is held normally in a closed position by the spring catch, which engages the lower pin. In another form of the shutter an ordinary hook is used in lieu of the spring and pneumatic bulb.

To prepare the shutter for operation, the outer strand of the rubber band is placed around the upper and shorter pin, as shown in the left hand figure. When the exposure is to be made, the shutter is operated by compressing the large bulb, which inflates the smaller bulb, thus pressing outwardly the spring catch and disconnecting it from the pin. The elasticity of the rubber band forces the shutter upward until the pin passes above the inner strand of the rubber band. The momentum of the shutter carries it upward, and bringing the longer pin into engagement with the inner strand of the rubber band, stretches the band, as shown in the right hand figure, thus arresting the movement of the shutter and storing power for closing it. The elasticity of the inner strand of the rubber band is sufficient to cause the shutter to drop quickly and regain its original position.

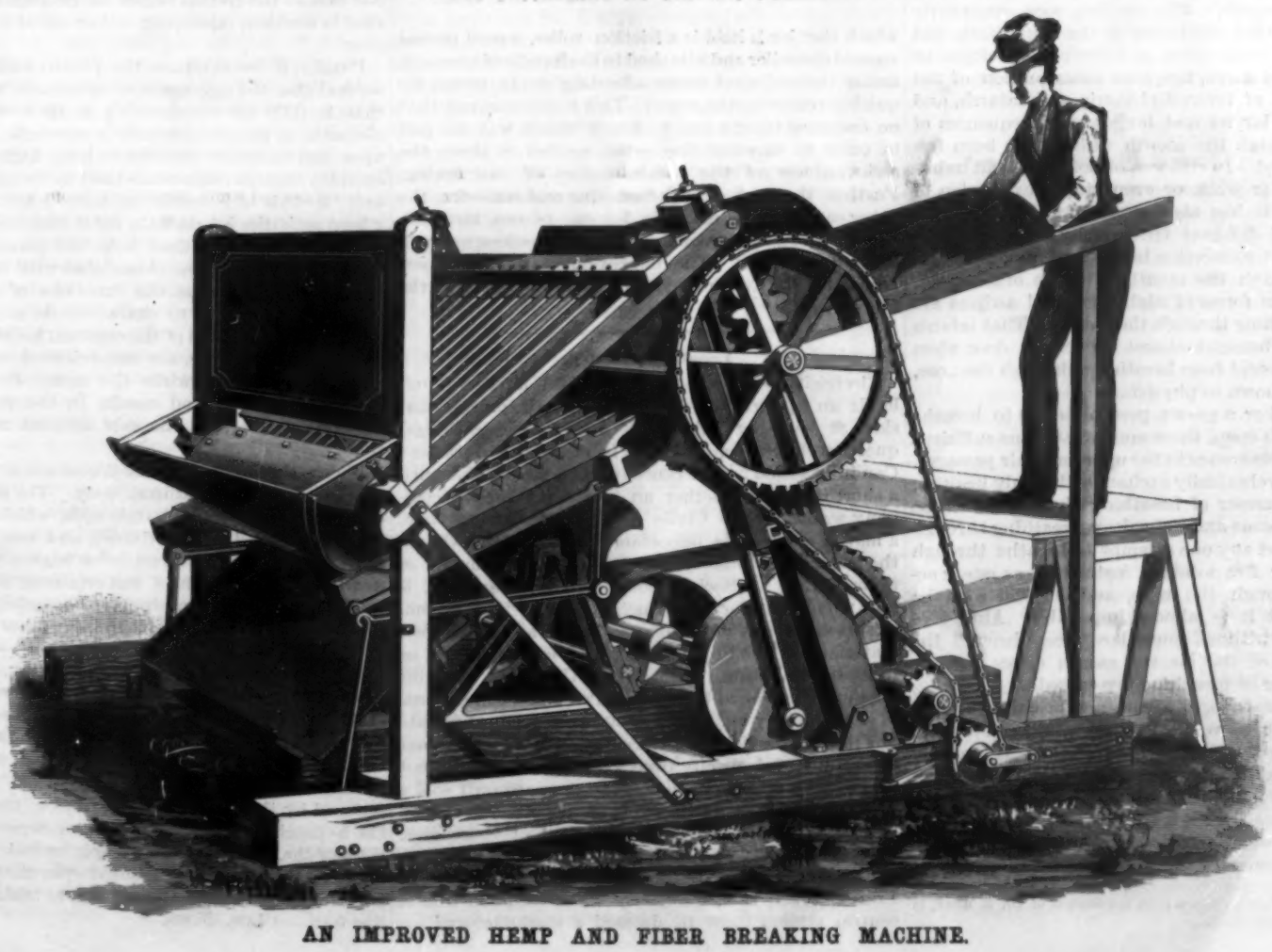
Draining the Zuyder Zee.

The government of Holland has for a long time past had under consideration a project for draining the vast lagoon known as the Zuyder Zee. This sheet of water is almost useless for purposes of navigation, and large vessels can only find their way to Amsterdam by means of the North Sea Canal. As agricultural land, however, it would be exceedingly valuable, since it is estimated that more than two-thirds of it is very fertile. The Zuyder Zee was formerly a lake, but in the twelfth and thirteenth centuries it was united to the North Sea by inundation. A commission was appointed some time ago to examine into the question of draining this territory, which has a superficial area of 760 square miles. A report on this subject has now been issued. It proposes to close the Zuyder Zee by means of a dam that shall be constructed from the mainland, on either side of the island of Wieringen. The water thus cut off from the sea would be divided into four parts, in each of which the work of draining would be carried out successively. The cost of constructing the dam is estimated at £3,675,000, and the draining would involve an expenditure of £13,000,000.

THE SHELY FIBER BREAKER.

The machine shown in the illustration is designed to break six to eight thousand pounds of hemp or similar fiber per day, with a ten h. p. engine and about nine hands—an engineer, a water hauler, a buncher, one feeder and assistant, three to receive and remove fiber, and one to take care of hurds. It is manufactured by Messrs. C. Aultman & Co., of Canton, O., and is reported to have been successfully used in breaking hemp in Kentucky, and to have given great satisfaction in an experimental test upon jute furnished for the purpose by the Commissioner of Agriculture, the machine being likewise adapted for work upon ramie, flax, and all similar fibers. There are at present three of these machines for use in breaking hemp in central Kentucky, one in Bourbon and one in Clark County, one on the farm of the inventor, Mr. J. D. Shely, near Lexington, and one also at Trenton, O.

From the top and back of the machine the fiber is fed through two feed rollers which adjust themselves automatically to any sized bunch, passing thence through the break, which is composed of a sash and four stationary feed bars. The sash passes between these stationary bars, breaking the hemp on both the up and down strokes, the bars being so arranged that they break alternately first on one side and then on the other, making each revolution equivalent to four strokes. Passing into the cleaner, the fiber is separated from the hurds—its coarse or hard part. The cleaner is composed of two bars, one stationary and the other vibratory, being longitudinally placed slats, the upper stationary one of which is smooth, while the lower vibratory one is grooved or notched. The vibratory bar or riddle runs by a compound elliptical motion, forcing the fiber between the slats of the stationary riddle and thence out of the machine. In breaking rough hemp stationary dividers are preferably placed between the break and the cleaner to split the hemp and better prepare it for the cleaner.



AN IMPROVED HEMP AND FIBER BREAKING MACHINE.

GLYCERINE, C_3H_5HO, is the hydrate of the trivalent radical glyceryl. It is a sweet, sirupy liquid, obtained by the decomposition of fats and oils, principally as a by-product in the manufacture of candles and soaps. The fatty acids are used to make candles and soaps, when combined with soda or potash. Pure glycerine is colorless and odorless, freely miscible with water and alcohol in all proportions; but with oils it only emulsifies, and does not perfectly blend. It is a solvent of many alkaloids and their salts, as well as resins. The purest is prepared by distillation; although not volatile without decomposition, yet it passes over undecomposed in the vapor of water, and may be concentrated by careful evaporation. This mode of preparing it was patented by Price's Candle Company, but now much distilled glycerine is imported from Germany. Glycerines of inferior quality have a disagreeable smell, and are sometimes colored. Good glycerine should not be colored after being subjected for two hours to the action of an added solution of the nitrate of silver.—*Cole.*

New Industries Resulting from the Building up of the Navy.

In a stirring speech recently made in the Senate by Senator Gorman, of Maryland, in favor of liberal appropriations for the navy, he said:

Under the provisions of those various acts, Mr. President, we have created plants which are a marvel to the whole world. It does not apply alone to the navy. We are equipping and have ready now the finest war vessels, of their type, that float upon the ocean. We have done more than that. We have created plants that are constructing vessels for commercial purposes. These shipbuilders claim, and I believe it to be true, that they are now prepared to construct the finest steel vessels on private account within 10 per cent of the cost of like ships constructed on the Clyde. We have in the State which I have the honor in part to represent three or four shipyards constructing vessels for the government and for commercial use. The largest plant in Maryland, and probably one of the best equipped in the country, is at Steelton, Baltimore Harbor, the president of which informed me a few days since that while they were prepared to construct the largest war ships, they had not and probably would not make an offer to construct a war ship, for the reason that his company had reached the point where they would have all that they could do on private account.

The concurrent testimony is to the effect that but for the appropriations heretofore made on account of the navy, none of these great plants would have been equipped with machinery to build war ships or the great ships for commercial use that are now afloat and being constructed.

Abnormal Breathing.*

Neither man nor animal breathes through the mouth normally. The only natural way for respiration and inspiration is through the nose. When we breathe through the nose, the cold, dry, impure outward air is sufficiently warmed, supplied with watery vapor and freed from dust. When we breathe through the nose, smelling at the same time through our organ of smell, which assists respiration, we become aware of the presence of an injurious or of a generally abnormal mixture drawn in by the breath, and can then either correct so unfavorable an atmosphere or escape from it. Furthermore, only in the nose are found those fine arrangements which can prevent the entrance of injurious substances into the deeper respiratory organs (larynx and lungs), and thus stop the further advance of the hostile body (painful smoke, irritating dampness, thick dust, etc.), besides defying that which has already slyly effected an entrance. This is done by the so-called nasal reflex breathing, to which class belongs sneezing. If we breathe through the mouth, the air is neither sufficiently warmed nor satisfactorily moistened, and laden with all its bad mixtures of dust of mineral, animal and vegetable origin, added to injurious gases, reaches the larynx, the air tubes and the lungs. Snoring is only the least among the evil consequences of breathing through the mouth. The swollen, sore, constantly chapped lips, bad condition of the front teeth and decay of the back ones, a defective development of the sense of smell, frequent inflammation of the throat, attacks of fever, diphtheria and catarrh, and soreness of the larynx and lungs are consequences of breathing through the mouth which have been frequently observed. In children one often sees an habitual and peculiar weak or even stupid expression of countenance. It has also been found, through the experiments of different trustworthy observers, that there is a causal connection between stammering and breathing through the mouth. On the other hand, however, certain forms of nightmare and asthma are causes of breathing through the mouth. That infants are sometimes brought almost to death's door when prevented by a cold from breathing through the nose, is a fact well known to physicians.

When a child or a grown person begins to breathe with the mouth open, there must exist some sufficient cause for the occurrence in the uppermost air passages. No one would voluntarily exchange the only healthy, comfortable manner of breathing through the nose for the burdensome and unhealthy breathing through the mouth. Let any one attempt to breathe through the mouth for five minutes, instead of, as one is accustomed, through the nose, and he will soon be convinced that it is almost impossible. Almost of itself, that is, without muscular force, through the mere pressure of the air, the mouth closes and the original manner of breathing is resumed.

Whoever snores can, as a rule, not breathe through the nose. That it would be useless in such cases to desire to close the mouth mechanically is entirely comprehensible. Every mother, who frequently gives to her child the useless command "Close your mouth," is aware of this. Here it is better to seek, without delay, the advice of an experienced specialist, in order to determine the cause of this mouth breathing. In the case of children, in particular, an unnecessary delay might prove fatal.

Now there are certainly cases in which the cause of this habit may be determined and the habit still remain. But these are the exceptions; as a rule normal breathing results as soon as the air enters the correct passages; if the snoring and breathing through the mouth returns as an evil habit, then and only then can mechanical means be used with advantage to stop this opening of the mouth.

The simplest and oldest of these is to place a band from the chin to the top of the head. This often suffices. As the mouth remains closed by pressure of the air, some of the mechanical appliances to produce this effect might be used. Sometimes it is even sufficient to place a piece of celluloid plate between the teeth, but one would not likely decide to place a foreign substance in the mouth of a sleeper, particularly a restless child.

All of these apparatus must be put on every evening, and worn overnight, until the normal position of the lips and lower jaw is regained. But the most important thing is to remove the obstructions to normal breathing.

* Translated for *Public Opinion* from the German of Dr. E. Bloch, in *Scherer's Familienblatt* (Berlin).

SHEELEY'S CANNING OR PRESERVING JAR.

The accompanying illustration represents a canning or preserving jar, provided with novel means to prevent its turning while the cover is being applied to or removed from it. The most satisfactory fruit jar in use, the Mason, is taken for the foundation. Its prominent features are retained, but a change of shape is made, by which it is held securely in the socket while the cover is fastened or removed.

The cover, which is screwed on, as in the old Mason jar, has on its upper edge fluted or scalloped surfaces, and a fluted wrench accompanies the socket. In the upper end of an arm at one side of the socket in

SHEELEY'S CANNING OR PRESERVING JAR.

which the jar is held is a friction roller, a cord passed around the roller and attached to the handle of a wrench fitting the scalloped cover, affording ready means for quickly removing the cover. This is so contrived that no one need be at a loss to know which way to pull in order to unscrew the cover, neither is there the awkwardness of the common way of unscrewing. Further, the work of both fastening and removing the cover can be done not only by *one person*, but with *one hand* of one person. This all housekeepers will find a great relief. The improvement has been patented by R. C. Sheeley, of Walter's Park, Berks County, Pa.

Legal Electricity.

Electricity seems destined to afford lawyers of all lands an opportunity of showing their professional skill at splitting hairs. In America several legal questions have cropped up. Is electricity dutiable? Can it be stolen? In France it was a moot point until a short time ago whether an electricity supply company was a Societe Civile or a Societe Commerciale, a matter of no little importance to investors, who in the latter case would only be liable for the amount of their shares. A Societe Commerciale, it appears, is one which has for its principal object "the accomplishment of acts of commerce," such as buying raw material and reselling it at a profit, manufactured, or in its natural state. The Edison Company, of Saint Etienne, summoned before the Tribunal of Commerce of that town by one of its customers, declined to submit to the jurisdiction of the court on the ground that the supply of electricity from a central station did not constitute a commercial act, "the company only sold a product which it gathered from nature, and which was a *res nullius*." The Tribunal of Commerce, nevertheless, declared itself competent to try the case, and on appeal its decision was upheld; so that in France, at any rate, electricity when supplied from a central station must be deemed a manufactured article. Across the Atlantic, where the manufacturing interest is dealt with very tenderly by the tax gatherer, a similar decision would add appreciably to the profits of central stations.—*London Electrician.*

The Potato.

As some perhaps look upon the potato, it appears to be a very admirable source of food for man, but it is hardly biological to attribute to the plant such exalted altruistic motives of disinterested generosity as it might imply if we should intimate that this is the end and aim of its existence. There is a class of mankind who appear to deem it proper, like Pope, to hold all nature to account for itself as useful to man, and such would doubtless say that the potato was created to be a food product. To the biologist's ways of thinking, this end of the potato's life is merely incidental—from its standpoint a very unhappy incident; the real end and aim of the potato's life is to propagate its kind, the storage of starch being a part of the plan.

The life of the tuber of the potato is part of the larger life of the entire plant. The history of the tuber is as follows: It starts from a bud on a preceding "seed potato," of which and of whose predecessors it may be thought to form a part, but really it is (like cuttings or slips from any plant) the beginning of what we may call a new plant. The early growth of the cells in the embryonic part of the bud requires food, to furnish which is the reason for the starch supply. But after a time the growing bud tissue differentiates into stem and leaves and rootlets, and then it can begin to depend, as all green plants do, upon the sunlight and the water and gases of the air and soil, and with their help construct its own substance. The starch of the potato tuber thus acquires a biological meaning. Its production and storage are perfectly analogous to the provision made in seeds. In the case of the peanut, we have also an underground structure stored abundantly with food for the undeveloped embryonic tissue, which is also part of the nut. The substance in many seeds is largely albuminous, as shown so abundantly in the pea and bean, also in the peanut, which is a close ally of the pea and bean.

Since the potato tuber and the pea or bean are thus comparable in two respects, both being the starting point of new individual plants and both containing cells which secrete and amass large quantities of food to nourish the embryo plant until its vegetative organs are developed, a hasty conclusion might be made by some that the potato is a sort of seed. This conclusion would be found by the study of the anatomy of the entire plant to be true only in a very particular sense, and not as meant in ordinary terms. The seed is the product of a ripened flower, while the tuber is not. There is a very great difference in the powers of potato seed and of the tuber bud; the latter propagates its kind absolutely and without variation, while propagation from seeds is very likely to result in the appearance of varieties unlike the parent plant. We have in this case an example of the law that nature works very variously toward the same end, using the stem bud in one case as the special organ of propagation and the seed in another, equipping either suitably for its purpose.

Finally, if we compare the potato with an animal, we find that the aggregate of its actions are anabolic, that is, they are constructive, so that as their result elements, or simple inorganic compounds, are laid hold upon and caused to combine to form higher and more complex organic compounds used in the plant's structure. In this it is unlike an animal, the aggregate of whose activities is katabolic, for it takes in highly complex chemicals (furnished from the plant's work) and gives out simpler ones. Associated with the difference is the further fact that the functions of motility and sensation, which are so characteristic of animals and are possible by reason of the constant katabolic character of its metabolisms, are unspecialized in the plant if not entirely absent, while the metabolic function is highly specialized and results in the production of anabolic products in the vast amount we see in the tuber.

We see then that the same forces are at work in the vegetable as in the animal body. The active agents of the tuber are protoplasmic cells, which work along lines determined by inheritance, and manifest certain of the protoplasmic powers in so high a degree as to nearly exclude the others, but retaining the two most universal powers of protoplasm—metabolism and reproduction.—*H. L. Osborn, Microscopical Journal.*

Possibility of a Gaseous State of Certain Metals at Temperatures below their Melting Point.

We notice the following experiment: Leaflets of silver, platinum, and gold were heated to 150° with concentrated hydrochloric acid in sealed tubes. The metals were dissolved and the chlorides formed were reduced by the hydrogen evolved from the metals and the hydrochloric acid. They were deposited on the sides of the tubes in microscopic crystals. It may be assumed that in this experiment even the platinum existed for some time as a liquid before taking a crystalline form.—*Chem. News.*

Correspondence.

How to Drill Glass.

To the Editor of the Scientific American:

Tell your correspondents if they wish to "drill glass," and do it successfully, to make a drill of the required size out of a bit of Stubs steel wire. Make the cutting edge just like a stone drill, having the corners square and sharp. Heat the drill with the blowpipe to a white heat and drop it instantly into water. A few trials will get it hard enough. Rotate the drill in a small drill stock, keeping the cutting edge wet with a solution of camphor in turpentine. Sharpen the drill occasionally on an oil stone. Such a drill will cut a hole through plate glass three-eighths inch thick in about one minute. If the glass is thin, paste writing paper on each side with common mucilage.

A little practice is necessary with this as with everything else. Having tried about every way mentioned in the books, I can say that this is the only way ever tried which did not end by breaking the glass. C. W. N.'s three-cornered file always broke my Holtz plates.

JOHN W. KALES, M.D.

Franklinville, N. Y., June 13, 1892.

Methods of Educating the Deaf.

A child born deaf remains, unless especially trained and instructed, wholly ignorant of verbal language. This verbal language, which comes in vocal sounds to the normal child through his faculty of hearing, reaches the deaf child only through his vision, and always in silent signs and characters—whether these be movements of the hand, which are called gestures, or of the mouth, which may be termed articulations, or are forms and pictures on the printed or written page. It is impossible for one born deaf, or one who has become totally deaf in early childhood, ever to gain an adequate apprehension of speech as this human faculty is used and enjoyed by normal persons. To the deaf, no matter how adept they may become in understanding the import of speech, by observing closely the oral and facial movements of those who speak, oral utterance must ever lack the life-giving quality of sound with all its attendant effects of eloquence, pathos, sympathy, sternness, persuasiveness, humor, and the like.

The merits of the two principal methods, the manual and the oral, have been earnestly pressed by their respective advocates from the earliest times down to a very late day, and controversies over them, always warm and sometimes bitter, as was the case with Heinicke and De l'Epee, have recurred with varying frequency. So long as the question was which of the two should prevail to the exclusion of the other, small progress was made toward a settlement. But within a few years a conciliation and combination of methods have been shown to be both practicable and desirable, and it is in the union of elements once thought to be necessarily antagonistic that a careful consideration of "values" in the education of the deaf becomes important. The single objection to the exclusive practice of the manual method is that under it no provision is made for the teaching of articulation and speech reading to that very considerable proportion of the whole number of the deaf who are indisputably capable of these very valuable acquirements. This objection is a serious one, and yet it is true that under the manual method, with oral teaching entirely omitted, the intellectual, moral, and religious training of the whole body of the deaf can be effected much more easily than under the oral method. Industrial teaching can be readily given, and the children, as sent out from the schools, are capable, with very few exceptions, of supporting themselves and of living happily and reputably in the communities to which they are returned, even though they are limited, in their communication with the hearing, to writing, signs, and the manual alphabet. The lack of speech is an inconvenience, but by no means an insuperable barrier to success in business or the attainment of happiness.

The best results in the education of the deaf can be obtained, not by the exclusive practice of either the manual or the oral method, but by making use of both, in such combinations as may be most practicable, and adding aural teaching for such children as possess a degree of hearing sufficient to comprehend articulate sounds. There are in the United States and Canada at the present time eighty-four schools for the deaf, in which 9,650 pupils are receiving instruction. Of these schools thirteen, having 402 pupils, are conducted on the manual method; nineteen, containing 1,104 pupils, follow the oral method, while fifty-two, containing 8,146 pupils, are conducted under the combined system. Considering that this system prevails in sixty-two per cent of the schools, containing eighty-five per cent of the pupils now under instruction, it may justly be called, as it often is in Europe, the American system. In effecting the combination of methods under this system, circumstances suggest, and often compel, differences of detail. The most satisfactory arrangements are possible in large schools, where each method may find its proper subjects in sufficient number for advantageous classification.

Among the nineteen in which the oral method prevails, and in which the sign language is unwisely prohibited, there are those in which earnest, faithful, intelligent work is done, and where the results in many individual cases are most commendable, sometimes even brilliant. But many children are retained in them that never succeed in speech, and who would derive far greater advantage under the manual method. In all these oral schools the sign language, in spite of rules against its use, is a constant means of communication among the pupils. The marked success attending the operation of the combined system in this country has attracted attention in Europe, and when, a few years since, a royal commission was appointed in England to inquire into methods of educating the deaf and other special classes, witnesses were summoned from this country to furnish full information to the commission as to the workings of our American schools. The advantages of the oral method and the combined system were presented by competent witnesses, and their testimony was published along with the report of the commission.—*Prof. Edward M. Gallaudet, in the Educational Review.*

Chloroform in Typhoid Fever.

Dr. P. Werner, physician to the German Hospital at St. Petersburg, has treated with the greatest success, so says *Merck's Bulletin*, 130 cases of typhoid fever by using a one per cent solution of chloroform (*La Sem. Méd.*) In pursuing this form of treatment the author was prompted by the work of Behring on the microbicide action of chloroform upon the bacillus of typhoid fever; but he was not familiar with the observations of Dr. Stepp, of Nuremberg, who, in 1890, successfully administered chloroform in cases of typhoid fever.

Dr. Werner employed, as has already been said, a one per cent solution of chloroform, the patients taking one to two tablespoonfuls every hour or two, *night and day*, without interruption, as long as the fever was at its height.

As the disease abated, the dose was progressively diminished, although, even after the fever had completely disappeared, the medicine was continued for some time, several teaspoonfuls being given each day.

In all the cases where this treatment was commenced before the tenth day of the disease, the most favorable results were obtained; the patients did not present the regular typhoid condition; the general symptoms were limited to fever, with feebleness and want of appetite; the tongue never got into that coated, dirty, and loathsome condition so characteristic of typhoid fever; the thirst, habitually so intense, disappeared in about two days; and the diarrhœa and meteorism progressively diminished and soon disappeared altogether. Bed sores were never observed, and relapses were very rare.

When the treatment with chloroform was commenced late, the disease being already in the third week, such extremely favorable results were not attained; but, even in such cases, the treatment proved very useful, and was always well borne. Nevertheless, in four cases Dr. Werner observed a jaundice, which in one instance was sufficiently pronounced to advise a suspension of the medicine. Three of these cases were in children; the fourth occurred in a young man.

It might be remarked, in conclusion that the observations of Dr. Werner agree in every respect with those of Dr. Stepp. The treatment of typhoid fever by chloroform appears to be deserving of the attention of the practitioner, not only on account of its efficacy, which has been proved by two investigators independent of each other, but also because of its great simplicity.

The Late Professor A. W. Von Hofmann.

The interment of this illustrious *savant* took place on the 9th ult. Baron Von Mirbach, on behalf of the Emperor and Empress, placed a splendid wreath upon the coffin. The Empress Frederick, the Grand Duchess of Baden, and the town of Giessen had also sent magnificent floral offerings. The Minister of Public Instruction was unable to be personally present, but was represented by Dr. Althoff. The University was represented by the rector, Dr. Foerster, the Judge of the University Court, Daude, and the Dean, Prof. Diels. The Academy of Sciences was represented by the perpetual secretaries, Professors Auwers and Mommsen, the Imperial Physico-technical Institute by Privy Councilor Von Helmholtz, the Patent Office by Privy Councilor Rommel, and the Imperial Sanitary Office by Dr. Koehler. The Technical High School and the Agricultural High School were represented by their rectors. Numerous universities and chemical societies had sent splendid garlands. The most distinguished representatives of the various societies took part in the ceremonies. The eulogium was pronounced by P. Stechow. The students of the first chemical institute of the University opened the procession to the cemetery. Then followed the funeral car drawn by six horses, and the carriages with the mourners; while the great body of the students with numerous banners closed the procession.—*Chemiker Zeitung.*

FROM CHAOS TO MAN.

BY GARRETT P. SERVISS.

In the following description the various scenes alluded to as illustrative of the development of the earth from a nebulous mass have been faithfully copied from the originals as portrayed in the Urania Scientific Theater, at Carnegie Hall, and the scenes will be described in their chronological and scientific order, and the various pictures which they refer to may be readily followed.

The opening scene, denominated "Chaos," shows the stage filled with whirling and hissing clouds of steam, suffused with weird light that slowly changes color as the awful elemental battle accompanying the deposition of the first ocean upon the new-formed and still heated crust of the earth proceeds. Finally, the raging clouds are chased away, the commotion ceases, and the face of the earth gradually emerges to sight, covered by the sea.

By slow gradations the scene changes. The creative throes have been transferred to the interior of the planet, and the effect of the strain upon its crust from within, as the pent-up fires struggle to break forth, begins to be manifested. A huge black ridge of rock appears in the gloom, thrust up from the sea bottom, and representing the first land of the new planet. Then an angry red overspreads the sky; fierce and broken storm clouds stream across the scene; the threatening hue of the heavens deepens; blinding flashes of lightning illuminate for a moment the rising land, which has swelled up into a mountain; heavy, rolling thunder is heard, and presently there is a deafening crash, the summit of the mountain is rent open, and volcanic fires pour forth. From the ocean, thus assailed by floods of molten lava, clouds of steam again arise, and, enveloped in tumbling vapors, the scene closes.

Thus the spectator has presented to him a most impressive representation of the formation of the first crust of the earth and of the tremendous upheavals and revolutions to which it was subjected at the beginning of its history, through the strain and compression that were produced as it cooled and contracted.

The next scene carries us forward millions of years to a time when the crust of the earth had become comparatively stable, and broad continents had appeared above the sea. This is the Carboniferous age, when the low, moist lands of the globe were clothed with a wonderful vegetation, forming strange forests, in which plants allied to some of the reeds and the club mosses of to-day attained the size of great trees, such as the *Lepidodendra*, the *Sigillaria*, and the *Calamites*. At that epoch the atmosphere was very dense and filled with carbonic acid gas. The luxuriant vegetation flourished upon the atmospheric carbon, and thus tended gradually to purify the air. Finally a change came, the Carboniferous forests began to decay, and their remains were swept together by floods, sunk in swamps, and, owing to changes in the level of the earth's crust, covered by the sea. In the course of ages the sea buried them deep under the ooze and mud of its bottom, and there, through pressure and chemical change, they were transformed into beds of coal.

Even before the first lands were formed life had appeared at the sea bottom. There were sea weeds and simple forms of animals, such as crinoids and mollusks. As the continents were formed, life crept out of the ocean, and gradually improved in its organization. Before the Carboniferous age the highest form of animal life had been the fish; but during that age amphibians, which show a progress in development from the fish toward the land vertebrate, appeared.

After the Carboniferous age, which finally closed with the formation of the coal deposits, there was a general revolution in the face of the earth. This epoch of transition was the Permian period. As represented upon the stage, the landscapes of this period appear open and variegated with lofty mountains, thus presenting a striking contrast to the level and swampy lands of the Carboniferous age, with their tangle of vegetable forms. Higher representations of plant life are seen, and the earliest reptiles make their appearance, the forerunners of the giants that were to rule the earth in the next succeeding period.

With the Permian period the so-called Paleozoic era (Greek *palaios* ancient, *zoe* life) came to an end, and the changes then wrought served to introduce the Mesozoic era (Greek *mesos* middle, *zoe* life). The culminating epoch of this era was the Jurassic period. The Mesozoic period is often called the age of reptiles. The Jurassic landscape shown at Music Hall is one of the most beautiful of the remarkable scenes employed to illustrate the progress of the earth. In the foreground magnificent palm-like trees, and other forest growths, bearing no little resemblance to modern vegetation, appear, while the middle distance is occupied by a sandy slope running down to the shore of the sea, whose blue waters fade away in the distance adorned with coral islands. Gigantic teleosaurs and iguanodons are seen upon the land, while the strange winged creatures called pterodactyls are flying above the margin of the water. The iguanodon, the pterodactyl and the archæopteryx marked the gradual development of the bird out of the reptile. Yet the

CRETACEOUS PERIOD—BOTTOM OF CHALK SEA.

iguanodon, which was one of the first reptiles to exhibit in the structure of its bones and the form of its legs and feet bird-like characteristics, was a ponderous monster, weighing several tons!

The Cretaceous or chalk period closed the Mesozoic era. At this time reptilian life continued to flourish, and plants made a wonderful advance. Two Cretaceous scenes are presented upon the stage, one being a land view, filled with beautiful forest trees, representing many of our modern forms, such as the oak, the sycamore, and the maple; and the other a view of the sea bottom, covered with splendid corals of many hues, and scattered heaps of varicolored shells seen through the blue medium of the water which fills the whole stage. In the later Jurassic and the Cretaceous periods, a shallow sea ran across our continent from the Gulf of Mexico to Alaska, and in the deposits formed by this sea the remains of some of the most remarkable monsters of the age of reptiles have been discovered. Among these were the atlantosaurus, the largest land animal known to have ever existed, whose length was not less than 100 feet, while it probably stood 30 feet high! Then there were the stegosaurs, giant reptiles furnished with a wonderful armor of bony plates, and having a sort of secondary brain in their backbones, larger than that in their skulls.

The next age, the Cenozoic era (Greek *kainos* recent, *zoe* life), began with the Tertiary period. The stage is set with a view of the Alps and the site of the present lake of Zurich. At that time tropical warmth prevailed in Central Europe. But a great change ensued, in the course of time, and an Arctic climate succeeded. The gradual fading of the daylight, the glowing of the snowy mountain peaks in the flush of sunset, the deepening gloom of twilight, and the sound of rain flooding the darkened landscape, convey to the spectator an impression of the vast geological and climatic changes which occurred during this period.

Next comes the age of the glaciers, whose broad flanks are seen glittering in the sunlight as they stream down the sides of the mountains. Both geological and astronomical causes may have been at work in producing this singular period in the earth's history. The best established view seems to be that glacial periods are periodic phenomena, depending principally upon

TERTIARY PERIOD—DAWN OF THE MODERN WORLD.

THE GLACIAL EPOCH.

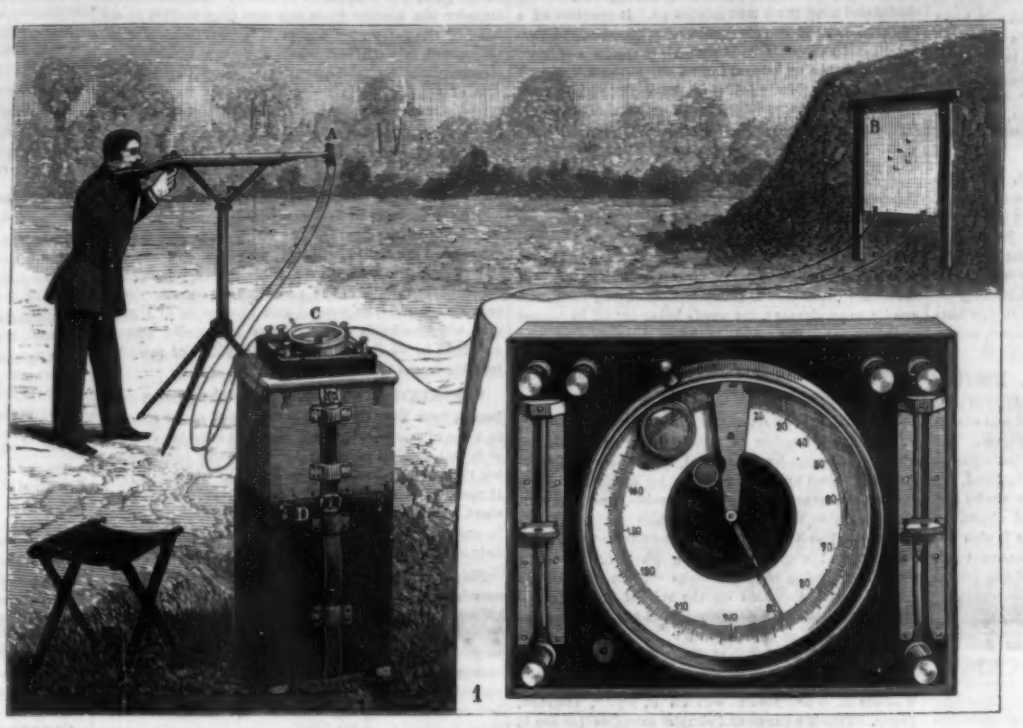
the eccentricity of the earth's orbit. If this is correct, we can approximately fix the time of the age of glaciers. It would seem to have begun about 240,000 years ago and to have ended 80,000 years ago. In about 150,000 years to come the orbit of the earth will again be so eccentric that a glacial period may supervene. Since indications of the existence of man close to if not within the glacial period have been discovered, the time estimate given above becomes of great importance in the light that it throws on the question, How long ago did man first make his appearance on the earth?

The next scene is distinctly within the human period of terrestrial history, and it represents the lake dwellings on the shores of the Swiss lakes, which are among the earliest known relics of the homes of man. A magnificent Alpine horizon, with great peaks towering against the blaze of sunrise, shuts in the lake in the foreground, which is surrounded with the singular structures that those early inhabitants of Europe placed upon platforms supported on piles driven in the water, and approachable only by bridges. Other remains of the early dwellings of man are the celebrated cave and cliff houses of Arizona and New Mexico.

The final scene represents the shores of the Mediterranean adorned with cities and villas—the age of civilization in all its splendor.

Perhaps the most beautiful and really marvelous features of these scenes are the light effects produced by a most ingenious and novel system of electric illumination, and exceeding anything of the kind that has ever been exhibited on an American stage. Under the ingenious, skillful, and scientific management of Mr. J. C. Mayrhofer, the electrician, improvements are introduced almost nightly in these effects. His hand seems to have learned the cunning of nature while manipulating the colors of Iris.

It is intended that next season, in addition to the "Trip to the Moon" and "From Chaos to Man," at least one entertainment shall be presented which will be illustrated by scenes painted by American artists, from American originals, and owing whatever excellence it may possess as a revelation of the educational capacity of the stage to American science alone.



APPARATUS FOR MEASURING THE VELOCITY OF PROJECTILES.

THE CHRONOGRAPH.

The apparatus which we are going to describe was constructed for the purpose of measuring the initial speed of projectiles.

The chronograph of Mr. Schmidt, which is capable of measuring as minute a period of time as the ten-thousandth part of a second, is based on this principle: The regularity and rapidity of the movement of the balance wheel of the escapement enables measurement to be made of intervals of time much less than that of one oscillation.

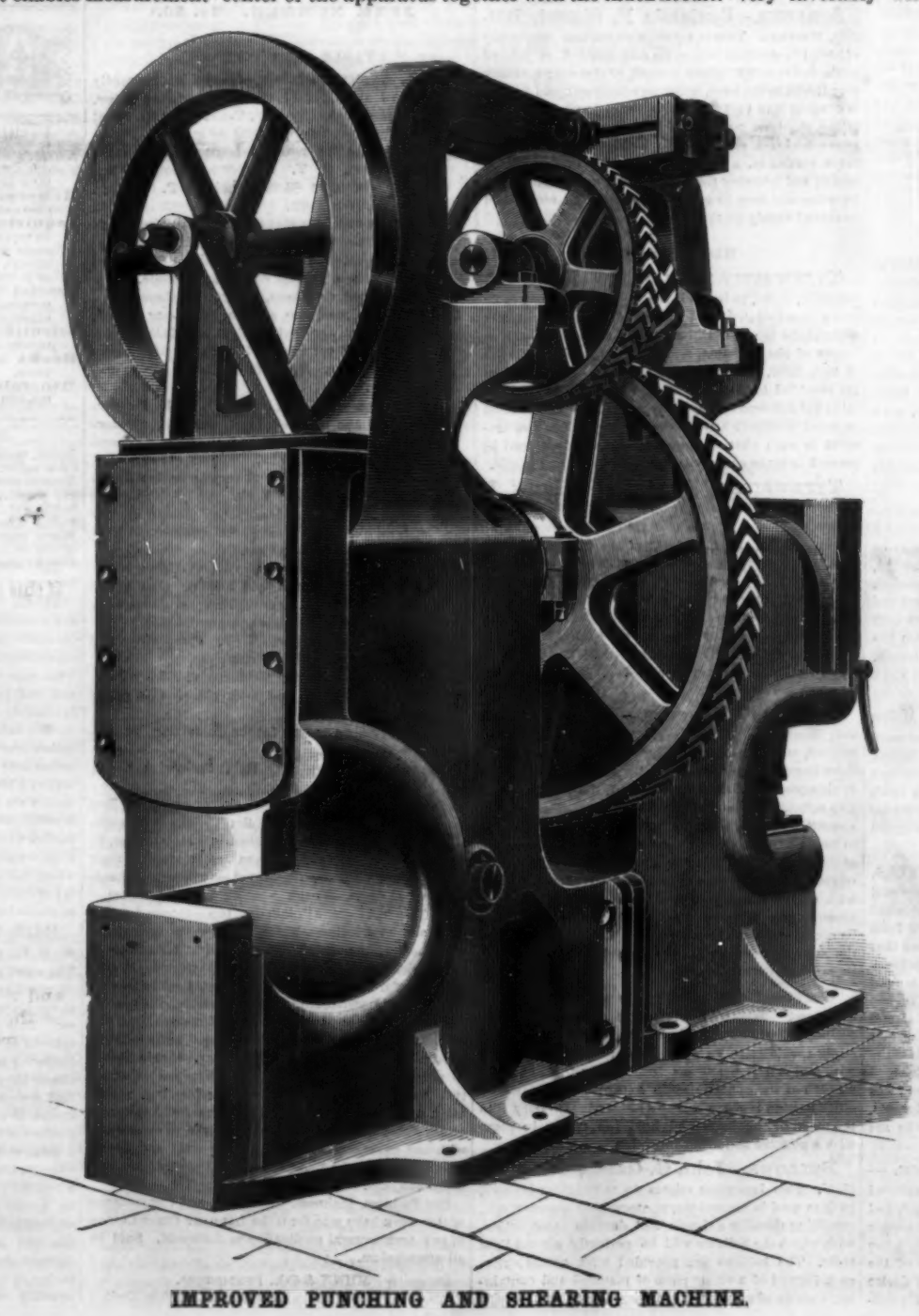
A special mechanism gives a constant range of 360° to that wheel to which is connected an index which marks thousandths or ten-thousandths of a second. The pointer is turned to zero. The spiral spring is then turned around half way, and the balance wheel when at rest is in the same position as the free balance wheel at the end of an oscillation. It is started and stopped by means of an electric current, which is broken at the moment of taking the observation and which is set in motion again when it is finished. The number of divisions compassed by the index during this interval gives the duration of the flight of the projectile.

The balance wheel for measuring the intervals less than an oscillation is independent of the spring and of the escapement. The index pointer is turned by means of a thumb screw, designed for that purpose, to the zero point. The balance wheel is made of soft iron, and is held set by means of an electro-magnet through which a current is passed of any desired intensity. These magnets become inactive and release the balance wheel at the beginning of the experiment, and do not stop the wheel until the end of the trial. This construction prevents the loss of time in starting and stopping which is so often found in apparatus of this kind.

These chronographs have been used principally for measuring the initial speed of projectiles. At the moment of discharge the projectile breaks the current by cutting a wire which is stretched in a primary frame attached to the end of the gun. The chronograph continues to operate until the projectile passes through a secondary frame located in front of the target and which finishes the experiment. The graduation of the index into thousandths and ten-thousandths of a second is facilitated by the use of a break mechanism consisting of a heavy weight which is allowed to fall, and which during its flight, at certain points determined upon beforehand, breaks the current of the electro-magnet.

The chronograph is shown in detail in the right hand view of the engraving. The index is located at the center of the apparatus together with the index needle. The rheostats for regulating the current are located on both sides. The first connects with the frame located on the gun; when the discharge takes place, the projectile breaks the current at it, and the chronograph operates until the projectile passes the second screen in front of the target. It is possible, therefore, to read the exact interval that has elapsed while the projectile has passed between the two screens. If the distance is fifty meters, the device will indicate the number of meters traversed each second. The graduations on the index are very perfect and make an exact record of the making and breaking of the current.

The chronograph is very easily managed. The two currents are first regulated by the rheostats; the pointer is put back to zero by means of a thumb screw, and when this is done the chronograph is ready for operation. The chronograph Schmidt seems to possess certain advantages over the apparatus now in general use. It is portable and requires no solid foundation. It can be placed near the gun without being injuriously affected by the discharge thereof. It requires no special knowledge on the part of the operator. The index needle operates with the greatest precision. The indicator can be easily read, especially with the aid of a magnifying glass mounted on the apparatus. The results of experiments made at various time stations compare very favorably with the results obtained by other apparatus.—*La Nature.*



IMPROVED PUNCHING AND SHEARING MACHINE.

IMPROVED PUNCHING AND SHEARING MACHINE.

The punching and shearing machine illustrated herewith was designed and constructed by the Southgate Engineering Company, near London. Our illustration is from *Engineering*. The gear is all of the double helical form, strong and yet noiseless in working. The punching gap is 30 in. deep, so that it can punch a hole in the center of a plate 5 ft. wide. The lift is 3¼ in., and the main shaft is of steel and of large dimensions. All bearings are bushed, above and below, with gun metal. There is a bearing in center, directly above the angle shears, and the parts that make up the angle cutting arrangement are all of steel and of extra strong proportions. It is made to carry a crane in the center, the supporting seats of which are shown in the engraving. The machine generally gives the impression of great strength, compactness, and adaptability to the work it has to perform.

SCHUTZENBERGER, in a recent number of the *Comptes Rendus*, has described experiments which apparently conclusively prove that nickel is volatile in presence of hydrochloric acid. Both when nickel chloride is reduced in a current of hydrogen and when hydrochloric acid is passed over finely divided nickel, traces of nickel chloride are found in the further part of the tube when heated to dull redness. Precautions were taken to prevent any mechanical conveyance of the nickel salt, so that the effect must be analogous to that of the action of carbon monoxide on nickel and iron.

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR COUPLING.—Daniel Kint, Alpena, South Dakota. Two operating levers are pivotally connected together at their inner ends, and there is connection between the levers and the coupling pin, to raise and lower it, in connection with a latch and hand levers connected with the latch, there being a keeper on the end of the car adapted to engage the latch. The device may be conveniently coupled with the ordinary link coupler, and opposing cars may be uncoupled without the trainmen passing between them, while the coupling pin may be locked in elevated position if desired.

RAIL JOINT.—John N. Lewis, Coulee City, Washington. The chair is, by this invention, formed with a base plate, a side plate, and a transverse portion within the hollow formed by the juncture of the plates, and provided with a seat for the fish plate and locking plates. The transverse portion and the fish plate sections serve to hold the lock plates in position, and the lock plates operate to prevent the nuts from jarring loose, the whole forming a strong, secure rail joint.

RAILROAD GATE.—David M. Dewitt, Bee Branch, Ark. This is an automatically working device, the gate being designed to be opened and closed by an approaching and departing train or wagon. The construction is such that an approaching train passes from the fixed rails to rails on a hinged platform, the depression of the latter operating through shafts and links to open the gate, which is afterward closed by connected weights and levers. The device is also applicable, with some modifications, to a wagon road, the gate being then opened by the weight of the wagon and afterward similarly closed.

ELEVATED RAILROAD.—Eliphalet L. Arnold, Georgetown, Texas. This invention provides a construction designed to be comparatively cheap and absolutely safe, with which the cars will ride easily, and which can be readily adapted for both passenger and freight traffic. The railway is supported upon sectional hollow posts, from whose upper ends extend lateral arms, which pivotally uphold a continuous steel truss, the base plate of which forms a support for the track rails, the cars being suspended from the tracks through yokes. If desired, the cars may be brought near enough from the ground to be entered therefrom, or the entire mechanism may be light enough for the cars to be operated by horse power.

Electrical.

ARC LAMP.—Robert H. Thurston, Ithaca, N. Y. This invention provides a lamp having broad, flat carbons moving in the same vertical line or in approximately parallel lines, with the carbons arranged in planes intersecting at a small angle to prevent their slipping by each other, or jamming and welding together, thus extinguishing the lamps when shaken by the wind or other force. The angle in practice is not so large as to make any material difference in the length of the arc formed between the center and the ends of the carbons.

Mechanical.

WOOD TURNING MACHINE.—Abraham Stoner, Stony Point, La., and Francis M. Pennebaker, Pleasant Hill, Ky. This is a machine for turning solid staveless hulls or bodies of tubs, buckets, or similar wooden ware from a solid block, the invention being an improvement on a former patented invention of one of the inventors. By the improvement increased simplicity and strength of parts is secured, greater accuracy of adjustment and reliability of operation, with more compactness and better adaptation for convenient manipulation and control of the machine by the operator, doing better work more quickly and economically.

CARPENTER'S SQUARE.—Mark P. Paterson, New Rochelle, N. Y. This square is so constructed that one arm may be manipulated to strike a right angle or an angle more or less obtuse, as may be desired, several slides containing scales being located, if wished, in an arm of the square for use as needed. One of the slides may be removed from the arm and used in conjunction with and adjustable upon both arms to form triangles as required, and the square has scales for facilitating the calculation of the length, pitch, or angle of rafters, and for various other work useful to carpenters in house building.

WIND MOTOR.—Hagbarth Winge, Miles City, Montana. This motor has a frame with a central post carrying a pivot, on which turns a wheel having vanes on its rim carrying sails, a gear wheel on the hub of the wheel meshing with a series of gears on a shaft connected with the machinery to be driven. The motor is simple and durable in construction, and is designed to actuate pumps and other machinery.

MOULD FOR ELECTROTYPE SHELLS, ETC.—Jacob C. Wolfe, New York City. This is a mould capable of being quickly and conveniently knocked down or separated in sections, and disconnected from the block when cast, while its construction is such that it may be utilized for casting large or small backings or blocks, as desired. The flask has a shoulder around its interior and within is a series of core blocks of less height, each block having an external shoulder and having their lower adjacent faces inclined, core plates resting against the faces of each block and against the inner walls of the flask, and there being wedge-shaped spacing blocks or keys between the lower inclined faces of the blocks. This backing is very light and durable, being braced in every direction, and the blocks are quickly, accurately, and economically made.

FUR SEWING MACHINE DEVICE.—Catharina Boos, New York City. This is an improved guide attachment, for use in sewing fur, leather, and other goods, to bring the parts into the exact proper position, and provide means for brushing the fur away from the seam, exposing the skin to the action of the needle and keeping the fur away from it. The device consists of an open-ended hood having a central partition extending through it with brushes on its sides and with a revolubie brush turning at one end.

LUBRICATOR GLAND.—Fortunatus G. Kellogg, Brainerd, Minn. This is a device designed to be conveniently applied to reciprocating shafts, such as piston rods, valve stems, etc., to be readily held on the shafts and keep them well lubricated. It consists of a box composed of two sections hinged together and having opposite their place of hinging a staple and hasp, while there is a peripheral funnel on each section, and the adjacent or meeting sides of the sections have registering semicircular openings forming the shaft passage.

Agricultural.

POTATO DIGGER.—William H. Van Voorhis, Spearville, Kansas. This is a machine of simple and durable construction for digging potatoes, peanuts, etc., separating them from the dirt and weeds, and also separating the small and large sizes and passing the latter into a bag. A plow on the front end of the digger plows up the potatoes so that they pass rearwardly to an elevator, the weeds being cut off by cutters or shears, and the potatoes being turned over and screened on the elevator slats until they are finally passed on to a separating plate and thence to a hopper, from which they are removed to a bag.

TETHER.—William E. Bradley, Roscoe, N. Y. This is a tether in which the rope is paid out when pulled upon by the animal, and the slack is automatically taken up and wound in by suitable winding devices, the tether being cheap, durable, and compact, easily portable, and suitable for stalls as well as outdoor use. The body or frame of the device has a vertical rack, and a gravity winding wheel for the tether rope, there being friction disks on the axle of the gravity wheel, and pins on the hub of the wheel engaging the rack. Means are provided for securing the tether to a stall, or to a post, tree, or fence. [Address Tether Mfg. Co. 325 North st. North Middletown, N. Y.]

COTTON CLEANER AND CONDENSER.—William B. Wherry and William F. Smith, Overton, Texas. This is a cheap and simple machine for use in connection with a cotton gin, for rapidly separating the dirt from the cotton and condensing the latter to be easily handled and baled. The case or frame has an inlet at one end and an outlet at the other, between which an endless screen belt is held to move, a sand box being within the belt, and air pipes opening from the sides of the sand box to convey the dust and dirt away. The drums for the carrying belt are arranged beneath the inlet and above the outlet, and a spring-pressed corrugated hood is hinged to the case and extends above the upper drum.

SCRAPER.—Benjamin F. Shuart, Billings, Montana. This is a device which may be quickly adjusted to scoop or scrape up any desired amount of earth, delivering it where wanted, or strewing it evenly over the adjacent land, being especially adapted for use in grading land preparatory to irrigation. The frame of the machine consists of two parallel runners, between which a scraper with beveled edge is held to move vertically, a pivoted lever affording means for raising and lowering the scraper. By manipulating the lever the dirt may be gradually allowed to escape and be spread evenly on the ground.

Miscellaneous.

TYPEWRITING MACHINE.—Allard E. Benedict, Cairo, Neb. This is a machine designed to be easily manipulated, and arranged to print directly without the use of a ribbon single characters, such as letters of the alphabet, numerals, etc., and also words of two, three, four, or more letters each. Inking rollers are provided to ink the type, and the type holder contains 120 different types, the type holder being mounted to travel longitudinally on the carriage. The arrangement is such that no separate key or lever need be pressed to make space between two succeeding words.

TYPEWRITER REGISTER.—Harry I. Cromer, Rapid City, South Dakota. This is a simple device, adapted for attachment to any form of typewriter, and, by the movement of the keys and space bars, will accurately count and register the number of words printed by the machine. A recessed sliding bar to operate the register is arranged adjacent to the space bar, a spring on the sliding bar having a lug to enter the recess and a lug on the space bar contacting with a lug on the spring, while a stud on the sliding bar and a block on the spring are arranged in the path of the type rod and space rod lugs.

JEWELER'S FORCEPS.—David Mendelson, Eureka, Utah Territory. An article, or several articles, may be held at any desired angle by the use of these forceps, which are especially adapted for holding or clamping articles to be soldered, the device being also suitable for use in other lines of manufacture. In a supporting post, slotted at its upper end, is mounted to swing a bolt, to which arms are adjustably secured at their inner ends, being gradually curved upon themselves at their outer extremities, tweezers provided with eyebolts being adapted to slide from the arms around upon their curved extremities. The articles to be operated upon are clamped in the tweezers, when the latter are brought into the desired position and held there by various thumb nuts.

WATCH CASE SPRING.—John E. Ketchem and Thomas C. Nixon, Morrilton, Ark. The spring, according to this invention, is provided with a stiffly turning rivet or screw, having its head provided with a nick or other means for turning it, and having on each of its opposite sides a projecting lip, whose outer portion is sharpened to a knife edge, to bury into the metal of the bezel and hold the spring in place with a positive and firm connection.

BELLOWS.—John G. Gareis, Brooklyn, N. Y. This invention relates to rectangular bellows, such as used in accordions, photographic cameras, etc., providing therefor a simple and durable construction, with which the bellows will be perfectly air and light tight. The bellows are provided with corner strips, each formed of a single piece of material and containing a series of rounded-off corners arranged alongside of one another, and adapted to be fastened by their legs to the folds of the sides and ends of the bellows.

CHANGE RECEIVER AND TRANSFER.—West R. Uchtmann, New York City. This is a device to be applied to a counter or similar support to receive change, and it is adapted to be readily manipulated to transfer the change from the receiving section to the hand of the person for whom it is intended. The arrangement is such that when a person receiving the change places his hand and presses upon a hinged section of a table, palm upward, a change-receiving receptable is tilted so that the change will slide into the hand.

ROLL PAPER HOLDER AND CUTTER.—Edwin E. Sentman, Philadelphia, Pa. The construction of this device is such that the knife, by means of which the paper is to be severed into lengths, will follow the roll downward as the latter decreases in diameter, and the knife will, through the medium of a roller interposed between it and the roll of paper, exert constant tension upon the paper. The construction is very simple and inexpensive, and the frame of the device, with the knife and roll, may be carried upward and held in an elevated position to admit of insertion into the frame of a roll of paper.

COOKING UTENSIL.—Augusta R. Isaacs, New York City. This is a vessel to be inserted in a pot of water, where its contents may be steamed or boiled without escaping therefrom, the contents being then removed to a platter in bulk without injury. It consists of a perforated body, preferably made of sheet metal, with an open top and bottom, an opening in one side near the bottom and brackets on the inside below the opening, on which slides a perforated plate.

Note.—In the description of Mr. C. N. Wall's feeding attachment for paper folders for use in newspaper offices, the following typographical error occurred: The notice states that the feeder will place the papers in position to be folded *with* the aid of any gripping mechanism or any hand-operated machinery. It should read: *without* the aid of any gripping mechanism or any hand-operated machinery.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(4418) G. S. J. says: I would like to ask a question (to be answered in Notes and Queries) on which there seems to be a great difference of opinion among engineers. On a plain horizontal tubular boiler, what stage of water is most economical (as regards labor and fuel) just as low as safety will permit, or as high as is possible without drawing water through the engines? A. The safest and best practice is to carry the water 4 inches over the tubes in boilers of 3 feet diameter, 6 inches over in boilers 4 feet diameter, and 8 inches in boilers 5 feet in diameter, when the rear end of such boilers are set from one to two inches lower than the front or gauge end. This gives the largest safe water surface for the liberation of steam and lessens foaming. High water makes wet steam, and is no safeguard to a boiler that is properly cared for. Wet steam is wasteful of fuel. Uniform feed and a uniform gauge measure as above indicated gives the best results.

(4419) C. E. B. says: In your reply to W. H. P., query No. 4360, date of May 21, you say: The water power of an artesian flowing well may be obtained by measuring the quantity of water delivered at the highest available point in cubic feet per minute, etc. This is true in theory. I would like to hear your opinion as to where the most power is exhibited in the following actual tests of a 7 inch well. Pressure when closed 130 pounds, gives 2 inch stream 80 pounds, 2¼ inch stream 72 pounds, 3 inch stream 62 pounds, 4 inch stream 58 pounds. Is the power in proportion to the product of the quantity multiplied by the pressure? The 7 inch well referred to is in Woonsocket, Sanborn County, South Dakota. It is driving a 3 foot Pelton wheel which is running a 150 barrel flour mill, owned by Northy & Duncan. I think they are using less than an inch nozzle and have plenty of power. I finished the well in November, 1891. The tests were made through short pieces of standard pipe from 6 to 18 inches in length. The depth is 775 feet. This is a fair example of the way the pressure decreases as more

water is used in South Dakota wells. A. This is the most reliable record that we have had of the condition of the flow under different heads and nozzle sizes from the artesian wells of South Dakota, and we give with pleasure our deductions. The standard wrought iron pipe of the sizes used for the streams are about 2 per cent larger than their nominal diameter, which will nearly equalize their flow to the coefficient of properly formed nozzles of the stated sizes. We find that the water head for the closed pipe is 200 feet, the static pressure of the well. With the 2 inch stream the head is 184 feet with a flow of 135 cubic feet per minute, equal to 47 gross horse power, or 40 developed horse power from a Pelton wheel. With the 2½ inch stream the head fell to 165½ feet with a flow of 207½ cubic feet per minute, with 65 gross horse power, or 55 horse power developed. For the 3 inch stream the head fell to 148½ feet and 377 cubic feet per m. with 74 gross horse power=62 developed horse power. For the 4 inch stream the head fell to 133½ feet, with a flow of 480 cubic feet per m., with 121 gross horse power=102 developed horse power. These ranges of variation in head and flow go to show the almost perfect freedom of inflow at the bottom of the 7 inch tube, as in some wells the head falls very fast under the enlarged flow. For the power used in the flour mill the pressure head is probably 250 feet, having a nozzle velocity of 7,600 feet per minute; and with the 1 inch nozzle and a flow of only 41½ cubic feet per minute, the 3 feet Pelton wheel is equal to 17 horse power, developed, and sufficient for the 150 barrel flour mill as stated. The figures show that the present use of this well is far below its capacity.

(4420) C. V. S. asks (1) for a corn salve. A. Dried carbonate of soda, ½ ounce; lard, 1 ounce; smalts (to color), q. s. Mix. The above are applied on a piece of rag, and renewed night and morning. Use for corns only. 2. How to clean carpets. A. If brooms are wet with boiling suds once a week, they will become very tough, will not cut a carpet, and will last much longer. A handful or so of salt sprinkled on a carpet will carry the dust along with it and make the carpet look bright and clean. A very dusty carpet may be cleaned by dipping the broom in cold water, shaking off all the drops, and sweeping a yard or so at a time. Wash the broom and repeat until the entire carpet has been swept. 3. For a fiber that would make a good letter that would look like the enameled white signs. A. Nothing better than white cloth or white enameled leather.

(4421) W. M. asks: Will you kindly explain to me in the columns of your valuable paper the meaning of the term "radius of gyration," that is the radius of gyration of an iron column, I beams, or an angle iron, etc.? Kindly explain fully and clearly. Have been studying for quite a long time, but cannot solve it. A. The radius of gyration of a column or a beam is such distance from its central line or axis that, if all the material in the section across the axis were concentrated there, its moment of inertia would equal that of the section. The moment of inertia is the product of the mass of the beam by the square of its radius of gyration. This is the basis upon which the strain due to the whole section under flexure is computed. For details of various forms of columns and beams, see Trautwine's "Engineer's Pocket Book," $5 mailed.

(4422) D. M. asks how to make an electric bell work from each end of the line of the telephone described in the SCIENTIFIC AMERICAN of December 14, 1889. A. To make a signal work at opposite ends of a single line wire you require a closed circuit. With two wires and the ground, you can work your signals on an open circuit.

(4423) T. M. R. writes: I am going to build a small motor, and wish to know if there is any way in which I can make it run slowly without waste of power, and also the best size of wire to use for the field and armature. A. By making your armature of large diameter, you can produce a slow speed motor that will operate without loss of power.

(4424) O. W. C. asks (1) how to polish walnut with shellac. A. Orange shellac, 2 ounces; wood naphtha, ½ pint; benzoin, 2 drachms. Mix and put in warm place for a week and keep the materials from settling by shaking it up. To apply it, make a rubber of cotton wool and put some old calico over the face, and till you have a good body on your wood keep the rubber well saturated with polish. When your rubber sticks, put a very little linseed oil on and rub your polish up. Allow it to stand a few hours and give it another coat, using rather more linseed oil on your rubber, so as to get a finer polish. Then let it stand again, and finish off with spirits of naphtha; if not, add a small quantity of polish to your spirit. 2. For a walnut stain. A. Water, 1 quart; sal soda, ½ ounce; Vandyke brown, 2½ ounces; potassium bichromate, ¼ to ½ ounce; boil for ten minutes, replacing water lost by evaporation. Use hot and allow the work to dry thoroughly before oiling or varnishing. Another reliable walnut stain for furniture, mostly hard wood: Spirits of turpentine, 1 gallon; pulverized asphaltum, 2 pounds; dissolve in an iron kettle on a stove, stirring constantly.

(4425) C. B. S. ask for an ink eraser. A. 1. Mix equal parts of oxalic and tartaric acids in powder. When to be used, dissolve a little in water. It is poisonous. 2. Oxalic acid mixed with citric acid may be used. 3. Equal parts of cream of tartar and citric acid in solution with water.

(4426) D. L. N. asks for a sticky fly paper. A. 1. Melt resin and add thereto, while soft, sufficient sweet oil, lard, or lamp oil to make it, when cold, about the consistency of honey. Spread on writing paper, and place in a convenient spot. It will soon be filled with ants, flies, and other vermin. 2. Boiled linseed oil and resin, melt and add honey. Soak the paper in a strong solution of alum and then dry before applying the above.

(4427) H. W. asks how the dolls of a chess game are called? A. The chessmen are called kings, queens, castles, knights and pawns. 2. How much is an ounce chloride of platinum worth? A. Chloride of platinum is worth $80 a pound.

(4428) Reader asks: 1. What is the length of a pendulum making one vibration in five seconds? A. 64·086 feet. 2. Power of eighty pounds applied to a wheel whose diameter is five feet, balances four hundred pounds. What is the diameter of the axle? A. One foot.

(4429) W. J. C. asks (1) how to remove rust from finely polished steel, such as drawing instruments, etc. A. Polish the rust from fine steel articles with flour of emery paper and gloss with crocus on leather. 2. How to remove dandruff? A. For dandruff wash the head once a week with weak borax water, an ounce to a quart of water. 3. How to prevent excessive perspiration of the feet? A. For sweating feet bathe them often in salt water.

(4430) H. E. T. writes: I have one of those electric cigar lighters, and I cannot seem to make it work any more. At one time it worked all right. There is a thin spiral of some kind of wire which when upon pushing the zinc in the solution becomes a white heat, and lighting a small alcohol lamp. Of late, the wire will only get warm. What can I do to remedy that and repair the concern? A. Apparently your battery has run down and needs renewal. As we do not know the style of the battery, we cannot give a formula for the solution. Better write the makers of the apparatus.

(4431) D. W. McG. asks: In transmitting motion by friction gears at right angles, using a flat disk for the driver and a square-faced wheel for the driving wheel, what percentage of power will be lost by friction? Is it practicable to use this style of gearing to transmit 8 horse power, and what is the relative efficiency of this style of gear, and ordinary bevel gear? Is the perpetual screw or worm wheel a practical method of transmitting 8 horse power, and what percentage of power will be lost by friction? A. The transmission of power as above described is not admissible for continuous action or for large quantities of power. The system is not economical, but may be very convenient for variable motion. The friction depends so much upon the width of the bearing surface and its distance from the center of the driving wheel that no definite percentage can be given. It should only be used for light and variable motion. If definite speed only is required, there is but little loss of power by friction transmission to angular lines with bevel wheels faced with leather, such being in use on centrifugal driers. The transmission by worm screw gear is practical and very useful for great reduction in speed, and is fully as economical in friction as the same reduction of speed by toothed gear.

(4432) F. W. J. asks: What is meant by the pass-over valve on a triple-expansion marine engine? Also, how can I find the north and south poles of a dynamo when in motion? How can I tell which is the positive or negative brush? Does the fan of a centrifugal pump force the water through the discharge or does it form a vacuum? A. The pass over valve is used in the steam pipe connection to the receiver of the low pressure cylinder for starting the engine. You can find polarity of the dynamo by placing a compass needle centrally over it. The north pole will point to the south pole of the dynamo. Then trace the wiring to find the polarity of the brush. A centrifugal pump derives its power, over both force and suction side, from the centrifugal force of the revolving water between the blades of the pump.

(4433) E. J. G. says: I wish to put in closets and bath rooms. We have no sewerage system. Would there be any objection to using a well for the sewer pipe to discharge into if properly covered? It being about 30 feet deep and not closer than 300 feet from any other wells? A. It would be dangerous to use the well as a receptacle for sewage. It would be likely to poison the neighboring wells, perhaps within a radius of half a mile or more. The safer way will be to make a tight cistern, for the sewage contents, to be emptied and taken away periodically.

(4434) C. H. B. asks: Will you kindly inform a constant reader, which is the proper way to lay a bell joint water pipe? Should the bell point toward the pump and against the pressure or point the opposite way. There is a right and a wrong way. Will you kindly give me the correct way? A. The practice in long lines is to lay the spigot end down stream or down hill. The bell end against the direction of flow or toward the pump. This is not always practicable in short lines with tees and crosses. Hence convenience of making joints is first considered. In vertical lines the bell end must always be up.

(4435) H. P. L. asks: 1. Give formula by which I may use certain chemicals which will gradually develop a steady pressure when confined, and not in a sudden or energetic manner. A. Magnesium, limestone, and hydrochloric acid or a very compact marble may be used instead of the limestone. 2. Also a solution which will impart a bright, silver-like appearance to metals, and which will cause it to remain so for some time. A. A solution of nitrate of mercury in water will work on brass or copper, but will ruin the metal. 3. What sort of battery would be best for a small necktie pin light as regards, power, size, and expense? A. A pocket storage battery. It is best to buy one rather than to attempt to make one.

(4436) T. E. R. asks: What is the dif- ference between momentum and inertia? Is it proper to say, "The trick rider in a circus finds it easy to jump from his horse through a ring and back to the horse again, as his inertia carries him along in the same direction as his horse?" A. The proper word is momentum, which indicates weight under motion. Inertia is from inert—motionless, and in physics means the condition of a body as to its weight and volume for receiving or resisting motion.

(4437) "Inventor" asks: 1. What acids have the effect of acting upon or softening granite or other stone, or what tools would give the best results besides the ordinary drills? A. No acid has this effect to a sufficient extent to be of any practical value. The sand blast and McCoy's pneumatic tool are of value. For the former, see SUPPLEMENT 416; latter, see SCIENTIFIC AMERICAN, No. 9, vol. 61. 2. Would aquafortis act upon cast steel? If so, to what extent? What solution should be used to give the best results? A. Yes; dilute strong acid with five volumes of water.

(4438) T. B. W. writes: 1. Give a sim- ple method of determining the purity of the so-called dry white lead and lead in oil now on the market. A. Dry white lead should be completely soluble in nitric acid. If ground in oil, the oil may be removed by benzine before treatment with acid. 2. Will heat applied to white lead in oil restore the lead to its former metallic state? A. It will more or less completely, depending on the percentage of the oil present? 3. If so, what proportion of lead should be gotten from same? A. No exact proportion can be given. White lead itself varies in composition, and the oil may be of different proportions.

Replies to Enquiries.

The following replies relate to enquiries recently published in SCIENTIFIC AMERICAN, and to the number therein given:

E. F. H.—The United States public debt, less cash in the Treasury, has decreased each year for the last five years, and each year since 1871. The 1st of July, 1887, it was $1,175,168,075. The 1st of June, this year, it was $843,353,356.

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